

**EPA Superfund
Record of Decision:**

**OUTBOARD MARINE CORP.
EPA ID: ILD000802827
OU 02
WAUKEGAN, IL
09/30/1999**

RECORD OF DECISION

REMEDIAL ACTION

**OUTBOARD MARINE COMPANY/WAUKEGAN COKE PLANT
SUPERFUND SITE**

WAUKEGAN, ILLINOIS

September, 1999

DECLARATION
SELECTED REMEDIAL ACTION
FOR THE
OUTBOARD MARINE COMPANY/WAUKEGAN COKE PLANT
SUPERFUND SITE
WAUKEGAN, ILLINOIS

Site Name and Location

The Site is identified as Outboard Marine Company (OMC) Operable Unit 2 (or the Waukegan Coke Plant) and is located in Waukegan, Illinois.

Statement of Basis and Purpose

This decision document presents the rationale for selecting the final Site-wide remedial action for the Waukegan Manufactured Gas and Coke Plant Site (WCP Site) and describes the legal and technical basis for the selection. The remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and is in compliance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to the extent practicable. This decision is supported by documentation contained in the Administrative Record for the WCP Site.

Assessment of the WCP Site

Actual or threatened releases of hazardous substances from this WCP Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), present a potential future threat to public health, welfare, or the environment.

Description of the Selected Remedy

The remedial action contained in this ROD applies to Operable Unit 2 of the OMC Site and represents the final Site-wide remedy. The selected remedy for the WCP Site addresses all potential pathways of exposure. It addresses the principal threats of contaminated soil through treatment and the low level ground water contamination through a combination of treatment and Monitored Natural Attenuation. The selected remedy is a modification of the Feasibility Study's Alternative 3. Specifically the selected remedy includes:

A. Vadose Zone Soil Remedial Components

- Excavation of the PAH Remediation Zone and the temporary storage pile of creosote contaminated soil and either off-site: 1) ¹treatment by power plant co-burning, or 2) disposal at a RCRA Subtitle C or D landfill.
- In-situ stabilization/solidification of the Arsenic Remediation Zone soil or off-site disposal.
- Combination vegetative, asphalt and building cover for Marginal Zone soil, the backfilled excavation areas and the southwest quadrant of the site.
- Institutional controls.
- Development of a comprehensive Soil Management Plan.

B. Ground Water Remedial Components

- Short-term (or phase 1), cell-based ground water extraction, on-site precipitation and biological treatment and on-site reinfiltration of treated ground water.
- Long-term Monitored Natural Attenuation (phase 2).
- Ground water use prohibitions.
- Five-Year Reviews

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on site, a review will be conducted within five years after start-up of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. This review will be conducted at least every five years as long as hazardous substances are present above health-based clean-up levels.

Data Certification Checklist

The following information was used in determining the selected remedy and is included in the ROD:

- ! A description of the Contaminants of Potential Concern and their respective concentrations;
- ! Baseline risk presenting the Contaminants of Potential Concern;

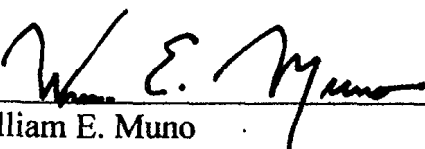
¹ Treatment is the preferred alternative for both the PAH and arsenic contaminates soils. Placement of the PAH soils on a landfill will only be if it is determined during the Remedial Design that treatment is not practicable (e.g., not feasible, excessive cost, etc.).

- ! Cleanup levels established for Contaminants of Potential Concern and the basis for the levels;
- ! Current and future land and ground water use assumptions used in the Baseline Risk Assessment;
- ! Land and ground water use that will be available at the Site as a result of the selected remedy;
- ! Estimated capital, operation and maintenance (O&M) costs, total present worth costs; discount rate; and the number of years over which the remedy cost estimate is projected; and
- ! Decisive factors(s) that led to selecting the remedy.

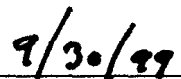
State Concurrence

The State of Illinois concurs with this ROD. A letter of concurrence is attached in Appendix C.

Authorizing Signature



William E. Muno
Director, Superfund Division
U. S. EPA Region V



Date

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DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

The 36-acre, Waukegan Manufactured Gas and Coke Plant Site (WCP), CERCLIS ID# ILD000802827, is Operable Unit 2 of the larger Outboard Marine Company (OMC) National Priorities List Site. The WCP Site is located in Waukegan, Illinois, on a peninsula separating Waukegan Harbor (the harbor) on the west from Lake Michigan (the lake) on the east (see Figure 1). The Site is mainly a flat open area with sparse vegetation. The northwestern portion of the Site is currently used for seasonal boat and trailer storage. A parking lot and an office building owned by Outboard Marine Company occupy an area at the southeast corner of the Site. The southwest area of the Site contains a large stockpile of harbor dredgings. Immediately south of Slip #4 is a covered temporary storage pile of creosote contaminated soils found during construction of the slip.

Commercial and industrial land and a harbor surround the Site on the north, west, and south. The harbor serves commercial shipping, including raw materials and cement delivery, and barge and tug mooring. It also provides access to maintenance facilities for recreational boating, and has marina facilities. To the east of the Site lies Waukegan Beach, a city park and recreational area.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The EJ&E Railroad purchased the Site in 1893 and the western portion of the Site was developed commercially as a creosote wood-treating plant in 1908. The creosote plant was dismantled sometime after 1917. Additional information is contained in the Feasibility Study Addendum for the creosote contaminated soils associated with this site use activity. The Site was initially used as a larger manufactured gas plant and then as a coke plant under various owners from approximately 1928 through 1969. The remaining coke plant structures were demolished in 1972. Between 1973 and 1989 OMC used the property for various operations and activities including fire training, public parking, and snowmobile testing. Larsen Marine currently uses the northwestern portion of the Site for seasonal boat and trailer storage.

The selected remedy for Operable Unit 1 of the OMC Site included excavation of PCB contaminated sediment and soils from the Waukegan Harbor, and several on-site ditches and lagoons. The most heavily contaminated soils and sediments were treated on-site and placed in one of three secured cells at the OMC Site. One of the secured cells was constructed in the former Slip #3 of the Waukegan Harbor. As part of the OMC cleanup, Slip #4 was constructed as replacement for Slip #3 which was used as a secured cell. During the construction of Slip #4, creosote contamination was discovered. The creosote contaminated soil was excavated and placed in a temporary storage pile located on the Site immediately south of the new slip. The discovery of this creosote contamination required additional Site investigation. The OMC PCB cleanup is fully complete and operating under long-term Operation and

Maintenance requirements. Although the PCB cleanup is complete, there are residual PCB concentrations on-site. The residual PCB cleanup concentrations are below the required cleanup levels determined in the OMC Record of Decision. Therefore, a discussion of the residual PCB concentrations appears in the risk calculations for the Waukegan Coke Plant but these risks are covered under the cleanup requirements of the OMC ROD.

After discovery of the creosote contaminated soils, U.S. EPA and the North Shore Gas Company entered into an Administrative Order On Consent (AOC) in September of 1990 for completion of a Remedial Investigation/Feasibility Study (RI/FS). RI field investigation activities were conducted in two phases; Phase I was conducted in 1992 and 1993 and Phase II was conducted from 1993 through 1995. A Preliminary Site Characterization Summary (PSCS), was finalized in April 1994. The purpose of the PSCS was to provide the U.S. EPA with a preliminary transmission of data collected during the RI and previous investigations before data evaluations were complete. The RI Report was submitted in 1995 and was approved in February, 1996. In 1995, a baseline risk assessment consisting of a Human Health Risk Assessment (HHRA) and a screening ecological risk assessment (ERA) for the WCP Site was performed. During preparation of the FS, supplemental sampling and data evaluation activities were performed to refine the conceptual Site model. Also, as part of the FS, several treatability tests were conducted to evaluate potential remedial technologies with respect to remediation of soil and ground water. The FS Report, finalized in November 1998, summarized the results of the additional investigations, the treatability studies and the development and evaluation of remedial alternatives. All sampling and analysis results relied upon in this ROD were performed under the AOC by Barr Engineering Company on behalf of the North Shore Gas Company.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The U.S. EPA released a Proposed Plan for the final remedy for the Site for public review and comment on February 22, 1999. The Proposed Plan and supporting documents were placed in the information repositories at the U.S. EPA Region V Office and the Waukegan Public Library. A Proposed Plan Fact Sheet was mailed to everyone on U.S. EPA's mailing list and press releases were sent to local media. Notice of the availability of the Proposed Plan was also included in advertisements in the Chicago Tribune and the local Waukegan newspaper. U.S. EPA held a public meeting on March 3, 1999 at the Waukegan Public Library. At this meeting, representatives of U.S. EPA provided background information on the Site, explained the Proposed Remedy, answered questions and accepted formal comments from the public on the Proposed Plan. U.S. EPA also accepted written comments during the comment period, which initially ran from February 22, 1999 to March 23, 1999. At the request of several stakeholders, the comment period was extended another 30 days. A response to all comments received during the public comment period is contained in the Responsiveness Summary, which is Appendix B to this ROD. WCP Site documents are available to the public as part of the Administrative Record which is housed at two information repository locations: (1) U.S. EPA Records Center for Region V in Chicago, Illinois; and (2) the Waukegan Public Library, 128 North County Street, Waukegan, Illinois. The Administrative Record index and addresses of the Information

Repositories are presented in Appendix A.

The U.S. EPA met with the Waukegan Citizens Advisory Group, solicited input from current owners, past owners and operators, the Illinois Environmental Protection Agency (Illinois EPA) and other interested parties on potential remedies and reasonable future land and ground water use considerations for this Site.

IV. SCOPE AND ROLE OF THE RESPONSE ACTION

The selected remedial action for the WCP Site provides a comprehensive, proactive approach for Site remediation and serves as a final Site-wide remedy. The overall Site soil cleanup strategy uses a combination of: 1) excavation and off-site treatment and disposal of PAH and creosote contaminated soils, 2) in-situ solidification and/or stabilization of arsenic contaminated soils as the remedy for principle threat contaminants, and 3) long-term on-site containment, cap and institutional controls of low-level residual soils. The overall Site ground water cleanup strategy includes extraction and on-site treatment of ground water, Monitored Natural Attenuation and ground water prohibitions to address the remaining low-level threats. The proposed remedy fully addresses both soil and ground water contamination at this Site. The proposed remedy builds upon the previously completed PCB cleanup conducted by the Outboard Marine Company and represents the final Site-wide remedy for the OMC NPL Site.

V. SUMMARY OF SITE CHARACTERISTICS

The Site characteristics are discussed in terms of the physical setting and natural processes at and near, the Site, the types of chemicals and their distribution in affected media, and the processes controlling the migration/attenuation of those chemicals.

A. Geology

Site geology is characterized by near-surface fill materials that were placed over a fine-grained sand unit. The sand overlies an 80-foot-thick till unit, which overlies a sequence of dolomitic bedrock formations. Figure 2 shows the surficial stratigraphy down to the glacial till.

Fill deposits are present across the surface of the Site at depths generally extending 2 to 12 feet below the ground surface. Demolition debris was placed at the WCP Site at the time of demolition of the coke plant facilities in 1972 by OMC, and the debris was covered with a thin layer of soil. The entire Site, including former pond areas, was filled and leveled as part of the demolition activities. The fill typically consists of reworked sand deposits with demolition and construction debris, as well as facility-related materials such as coal, coke, and slag.

The sand unit underlying the fill is generally 20 to 25 feet thick. It consists of a well-sorted fine to very fine sand containing 5 to 15 percent silt. Deeper portions of the sand unit typically show finer grain sizes than shallow portions. Measured porosity values range from 33 to 41 percent.

The long shore current in Lake Michigan causes a net transport of sediment from north to south along the western shore of the lake. Breakwaters extending out into the lake trap the sediment, causing sand to deposit and form a beach. This sediment transport is responsible for the formation of the sand unit on the Waukegan Harbor peninsula. The beach front moves lakeward as the sand, transported by long shore currents, accumulates. The sand accumulation is not a uniform or continuous process. Wind direction and wave action cause the beach to erode during some periods and grow during others. The beach front has generally been growing lakeward at an average rate of 11 feet per year. The growth of the beach is an important factor in explaining the distribution and attenuation of chemicals at the Site.

The till underlying the sand unit is approximately 80 feet thick beneath the Site. This unit consists of a hard lean clay with sand and some gravel. The surface of the till is overlain by a thin, discontinuous zone of silty gravel or gravel with sand, which, where present, has an average thickness of 0.3 feet. The surface of the till is irregular, and generally slopes gently downward from west to east beneath the peninsula.

B. Ground Water Flow

Ground water beneath the peninsula is driven by infiltration, which flows through the sand unit before discharging to the surrounding surface water. The sand unit is underlain by the virtually impermeable till layer. Ground water in the sand unit occurs about 4 to 5 feet below the ground surface. The ground water flow pattern consists of a hydraulic divide near the eastern boundary of the WCP Site, with flow to the east and southeast (toward Lake Michigan) and flow to the west and southwest (toward Waukegan Harbor), as shown on Figure 3. Flow is mostly downward near the ground water divide and mostly horizontal in other areas. Ground water flow rates are very low near the ground water divide, increasing to about 100 feet per year beneath the beach to the east, 60 feet per year at the harbor wall to the west, and 20 feet per year at the Site boundary to the south. These velocities are calculated using the RI Report hydraulic conductivity estimate of 31 feet per day (1.1×10^{-2} cm/s) for the sand aquifer, coupled with measured and simulated horizontal ground water gradients.

A horizontal ground water flow model was used to predict the average ground water discharge to the harbor and the lake. The calculated ground water discharge is 28 gpm to the harbor, 22 gpm to the lake (east of the Site), and 16 gpm to the portion of the lake enclosed by the breakwater (i.e., the area east of OMC Plant No. 1 and the City Waterworks). Additional vertical modeling of ground water discharge suggests that for that part of the sand aquifer that discharges to the lake, virtually all of the ground water discharges within 250 feet of the shoreline. The horizontal orientation of the beach/ground water interface produces upward movement of ground water (and hence vertical mixing of the ground water) prior to discharge to the Lake.

The stationary harbor boundary has produced a different ground water discharge situation on the harbor side. At this side, ground water discharges directly to the harbor through the sheetpile joints and any gaps that may exist in the wall. The vertically-oriented interface between the

harbor and the ground water produces an essentially lateral discharge of ground water (and hence no vertical mixing in the ground water).

C. Lake Michigan

Contaminated ground water from the Site is currently discharging directly to Lake Michigan. Wave action and long shore currents are important mechanisms affecting these ground water discharges. Surface water movements affecting discharged ground water are divided into two zones: the near-shore zone; and the long shore current (or littoral drift) zone. Depending on wind direction, the near-shore zone consists of either a breaker zone or a wind-induced current zone. The breaker zone is a well-mixed area close to the shore, defined as the area where the waves break. Based on a review of serial photographs of the general vicinity of the Site, the breaker zone extends 300 feet or more out from the lakeshore, encompassing the ground water discharge zone. Winds from the north, east, and south cause breakers, producing a breaker zone. On-shore winds (the prevailing westerlies) do not create breakers, but cause wind-induced currents that mix and transport the water. Considering wave- and wind-driven currents, the normal dilution of ground water discharges in this zone is estimated to be 12,000 to 1. The dilution could range in excess of 20,000 to 1 during the times when breaker waves are more than 2 feet high. Calm conditions, during which dilution may be as low as 2,900 to 1, occur at low frequency estimated at about 1.4 percent of the time).

A similar analysis was performed for the near-shore zone in the breakwater area (between the north harbor wall and the north breakwater). The normal dilution of ground water discharges in this zone is estimated to be 7,600 to 1. Dilutions could exceed 20,000 to 1 in this zone in windy conditions. Calm conditions may produce dilutions as low as 1,600 to 1.

The water in the near-shore zone eventually mixes into long shore currents. The long shore current zone extends more than 3,000 feet into the lake, as evidenced by sediment transport visible on aerial photographs. A mixing ratio of lake water to ground water of about 50,000 to 1 was estimated based on average measured near shore Lake Michigan currents. The actual contaminant attenuation rates are expected to be even greater than these mixing ratios since the ratios do not account for the biological, chemical, and physical attenuation.

D. Waukegan Harbor

Lake Michigan influences Waukegan Harbor in several ways. Most significantly, the nearly continual exchange of water between the lake and harbor, cause predominantly by wind-induced seiches, prevents stagnation of the harbor water. Average wind-induced currents in and out of the harbor are sufficient to exchange the volume of water in the harbor in one to eight days. The lake also causes mixing in the harbor by direct waves entering the harbor through the entrance channel.

Based on the lake/harbor water exchange and ground water discharge rates to the harbor, harbor

waters provide net flows to mix with Site ground water at ratios of 6,000 to 1 to 800 to 1. The average mixing ratio is approximately 1,600 to 1. Ground water flow to the harbor is a gradual phenomenon dispersed over a large area. Attenuation mechanisms (biological, physical, and chemical) which also reduce chemical concentrations are not considered in the mixing model.

E. Chemical Distribution, Migration, and Attenuation

1. Soil

The zone above the water table at the Site (i.e., the vadose zone) is from 0 to approximately 4.5 feet below ground level. The major chemicals of concern in vadose zone soils at the Site are polynuclear aromatic hydrocarbons (PAHs) and arsenic. The distribution of PAHs and arsenic in vadose zone soils is shown on Figures 4 and 5. An evaluation of the mass of PAHs at the Site shows that about 85 percent of the mass is present in about 7,000 cubic yards of soil. High arsenic concentrations are largely restricted to one area on the eastern part of the Site (see Figure 5).

Chemicals present in soils above the water table may be transported to the atmosphere (via volatilization or airborne particulates) and to the ground water (by infiltration). Chemical migration from vadose zone soils to air does not pose unacceptable risks at the WCP Site because surface soil samples indicate that volatile and semivolatile chemicals are not present.

Migration of chemicals from the vadose zone soils appears to influence limited areas of the shallow portion of the sand aquifer. Higher concentrations of PAHs and arsenic in the shallow portion of the sand aquifer are associated with the higher concentrations of these contaminants in vadose zone soils. The observed distribution of low molecular weight PAHs (the more soluble and mobile PAHs) and arsenic indicates that vadose zone soils act as a relatively limited source of these contaminants to ground water in the shallow portion of the sand aquifer. While vadose zone soils may be a source for some chemical migration, the extent and concentrations of low-molecular-weight PAHs in the shallow portion of the sand aquifer on the eastern and southern portions of the Site are less than might be expected in comparison to PAH concentrations in the vadose zone soil in these areas. Lower-than-expected concentrations may be due to natural attenuation mechanisms, such as aerobic bioremediation. Such natural attenuation mechanisms may also account for the observed absence of significant levels of benzene and phenols in the shallow portion of the sand aquifer.

The highest chemical concentrations in ground water occur in the deeper portion of the sand aquifer. Site data indicate that these concentrations are not due to current, continuing downward migration of chemicals in the vadose zone via infiltrating precipitation. This observation is supported by a number of facts:

- 1.) As shown in Table 1, the concentration of both inorganic (arsenic and cyanide) and organic (phenol and benzene) chemicals in the deep ground water are orders of magnitude

greater than those in the shallow ground water.

2.) Phenol is generally not detected in vadose zone soils or in the shallow ground water, although it is present at relatively high concentrations in the deeper ground water. Phenol is also detected in saturated soils of the deep portion of the sand aquifer where soil and ground water concentrations of phenol appear to be in equilibrium with each other. This suggests that soil contaminant concentrations in the deep portion of the aquifer are the result of adsorption of phenol from ground water.

3.) Soil and saturated zone concentrations of benzene, arsenic, and cyanide decrease significantly with depth. In contrast, ground water concentrations for these parameters increase by orders of magnitude with depth.

2. Ground Water

The generalized vertical distribution of chemicals (Table 1) demonstrates a stratification in chemical concentrations between ground water in the shallow and deep portions of the aquifer. The observed stratification appears to be due to past aqueous discharges, as opposed to the presence of dense nonaqueous-phase liquids (DNAPL), as explained below.

The 1997 beach transect ground water data are presented in cross sections on Figures 6 through 8 for ammonia, arsenic, and phenol, respectively. These figures show the strong vertical stratification of concentrations. The concentrations are at approximately background levels from the top of the water column down to depths within about 10 feet of the base of the sand unit. Below this level, the concentrations typically increase by order-of-magnitude steps until they reach their maximum in the lower few feet of the sand unit.

Figures 9 through 12 present plan views of ground water and surface water data from the Site investigation. The concentration isopleths on the figures represent the highest measured values from the shallow/deep ground water quality data sets. Samples of ground water from the shallow portion of the sand aquifer beneath the Site show arsenic concentrations generally in the range of 0.010 to 0.3 milligrams per liter (mg/L), ammonia concentrations in the range of 1 to 10 mg/L, and sporadic detections of phenol and benzene. The Maximum Contaminant Levels (MCLs) for arsenic and benzene are 0.05 mg/L and 0.005 mg/L respectively. Shallow ground water was determined to exhibit borderline aerobic/anaerobic conditions.

In contrast, ground water in the deep portion of the sand aquifer, shows anaerobic conditions; arsenic concentrations of 10 to 60 mg/L; ammonia concentrations of 100 to 2,500 mg/L; phenol concentrations of 100 to 1,000 mg/L; benzene concentrations of approximately 1 mg/L; and isolated detections of PAH compounds. For phenol the transition zone from background (shallow) to maximum (deep) concentrations is very small compared to that for chloride. Anaerobic biodegradation processes operating on the more dilute concentrations may be responsible for this thin transition zone.

The RI demonstrated that the vadose zone soil is not the current source of chemicals in the deep portion of the sand aquifer. The RI considered the potential presence of dense non-aqueous-phase liquid and dense aqueous solutions (i.e., solutions with a specific gravity greater than one) as possible sources for the deep ground water chemicals. The results indicate that DNAPL and dense aqueous solutions are not sources of the deep ground water contamination at the Site. Rather, the observed ground water quality stratification is attributable to the Site hydraulic characteristics and the chemical mixture (constituents and concentrations) of aqueous discharges during plant operations or during plant demolition.

Prior to demolition of the plant and closure of the Site, the Site ground water chemical characteristics were likely dominated by aqueous discharges near the ground water divide. The model indicates that water infiltrating from aqueous discharges located near the ground water divide would affect the entire aquifer (vertically down to the base of the aquifer) and migrate laterally throughout nearly the entire thickness of the aquifer. Since the elimination of these discharges after plant demolition in 1972, infiltration has been the dominant factor influencing ground water flow and chemical distribution. The effects of this infiltration have been more significant for the shallow portion (upper 20 to 25 feet) of the sand aquifer, contributing to the current stratification of very low concentrations in the shallow portion of the sand aquifer and much higher chemical concentrations in the deep portion (the lower 5 feet) of the sand aquifer. Thus, natural flushing processes and the Site's hydraulic characteristics (as demonstrated by Site ground water models) account for the observed ground water quality stratification.

To assess the potential presence of DNAPLs during RI investigations, most of the 78 soil borings placed at the Site and beach during the RI extended to the top of the till unit, and analytical samples were collected from the interval above the till. Field screening observations and analytical results of soil and ground water samples identified no pools of DNAPL at the Site. A small amount of separate-phase oily material was observed between grains of gravel from one soil interval above the till unit in one boring (SB-41); however, no sheen or DNAPL was observed in the water in the borehole. Furthermore, the chemistry of impacted soils in the vadose zone, from which DNAPL would have migrated, cannot explain the chemistry of the deep ground water. Thus, Site data indicate that there are no apparent large pools of DNAPL or significant migration of DNAPL at or from the Site.

To identify a potential source of the contaminants found in the deep portion of the sand aquifer, characteristics of the ground water chemical mixture and measured constituent concentrations were assessed. The observed chemical mixture in the deep portion of the sand aquifer is similar to the chemical composition of various aqueous effluents from coal conversion (i.e., coking/manufactured gas) operations, both in major constituents and in the general order of magnitude of concentrations. The similarity between the aqueous effluent values and Site ground water data from the deep portion of the sand aquifer suggests that historic Site operations or demolition activities, which involved aqueous discharges, were the contributing source of chemicals in the deep portion of the sand aquifer.

The results of the RI and post-RI modeling, sampling, and evaluations lead to the conclusion that the water quality of the deep portion of the sand aquifer is not attributable to DNAPL or dense aqueous solutions. The ground water quality stratification is consistent with aqueous discharges during plant operations or demolition, and the nature of ground water flow after plant demolition. The ground water flowing east from the ground water divide toward and beneath Lake Michigan may be subject to attenuation mechanisms including dilution, anaerobic degradation processes, and aerobic degradation processes. These natural attenuation processes occur throughout the sand aquifer, but are inhibited in the bottom five feet, where concentrations are high and flushing is limited. An anaerobic biologically-active zone exists at the upper fringe of the deep portion of the sand aquifer and possibly at the leading edge and lateral fringes of the phenol plume. Anaerobic degradation processes are believed to be reducing phenol concentrations in these zones.

Aerobic degradation of phenols, thiocyanate, and ammonia in Site ground water has been demonstrated after dilution of the ground water, and phenol- and thiocyanate-degrading aerobic microorganisms are present in Site soils. Aerobic degradation is also likely contributing to contaminant reductions in the fringes of the plumes where concentrations are below inhibitory levels and where oxygen is available from the atmosphere and from infiltration and penetration of Lake Michigan water. These results also suggest that such degradation processes can reduce residual constituent concentrations that might remain following periods of active ground water and soil remediation.

3. Surface Water and Sediment

Currents in both the lake and the harbor continuously displace and mix the surface water. Turbulent surface water mixing is orders of magnitude more vigorous than laminar ground water mixing. As impacted ground water discharges to surface water, these natural mixing processes significantly reduce its impacts on the lake and the harbor. In addition, other attenuation mechanisms, such as biodegradation, chemical changes, and sedimentation, tend to further reduce chemical concentrations.

Surface water sampling data for ammonia, phenol, benzene, and arsenic in the Site vicinity are shown on Figures 9 through 12, respectively. The ammonia concentrations in the July 1996 surface water samples in the harbor and the lake were between 0.076 and 0.097 mg/L. In August 1996, the surface water was resampled, and the ammonia concentrations were overall similar to those from July. The ammonia concentration in the harbor sample was 0.086 mg/L and the ammonia concentration in a composite of the three lake samples and the harbor sample was 0.094 mg/L. The limited 1996 sampling did not include sample collection from background near-shore zone areas, so no basis is available for assessing the source or the extent of the observed ammonia concentrations. The 1996 results exceeded the State of Illinois Lake Michigan open water standards for ammonia (0.02 mg/L), but not harbor and breakwater area standards (15 mg/L). The ammonia open water standard is not a human health or ecological based standard. The open lake ammonia standard was developed in an attempt to retain a

baseline water chemistry in the lake. No ammonia was reported in the 1997 surface water samples at a detection limit of 0.02 mg/L. The 1997 samples all met the stringent open water standards.

As ground water discharges to the lake and the harbor, natural mixing processes induced by wave action and currents further reduce the impacts of these discharges on surface water quality. Estimated surface water concentrations of Site chemicals for the peak annual mass fluxes from ground water (i.e., the maximum value for any time into the future), are summarized in Table 2. The reported values are conservative because they ignore other attenuation mechanisms (such as biological and chemical degradation), as well as sedimentation effects.

The surface water quality calculations indicate that the ground water mass flux is not expected to produce exceedances of standards in the breakwater area or in Waukegan Harbor. The HHRA (U.S. EPA, 1995a) evaluated ammonia and phenol in the surface water; these compounds are not considered to pose a human health risk, but at high enough concentrations they can be detrimental to aquatic life (U.S. EPA, 1995b). National Ambient Water Quality Criteria for the protection of aquatic life are included in Table 2. Based on the mass loading evaluation, no exceedances of these criteria are expected for any of the surface waters under any of the mixing scenarios. No exceedances of the very stringent water quality standards for the open waters of Lake Michigan are calculated for the long shore current zone, except for phenols under the lowest mixing scenario. Phenols are readily degradable, a fact not incorporated in the modeling, which will act to reduce the estimated concentration. The only exceedances of the stringent open water standards calculated for the near shore zone east of the Site are phenols and ammonia. None of the calculated concentrations exceeded aquatic life protection criteria. Cyanide and arsenic fluxes in the ground water from the Site are several orders of magnitude below the fluxes that might be expected to cause exceedance of standards in the lake or the harbor.

F. Current and Potential Future Site and Resource Uses

Historical Site Use

Records from as far back as the late 1800's indicate that the harbor has been used for industrial/commercial applications. Creosote wood treatment operations took place from approximately 1908 to 1917 and manufactured gas and coking operations from approximately 1927 to 1969. The Site was largely unused beginning in the early 1970's.

Current Site Use

The Site continues to be located in an industrial corridor and access to the Site is currently restricted by fencing and the harbor. The Site is largely vacant with the exception of the northwest portion of the Site which is used by Larsen Marine for temporary boat and boat trailer storage and the Southeast portion of the Site which has a parking lot and an office building owned by OMC.

Future Site Use

Based on current zoning requirements, discussions with Site owners, past operators, nearby businesses, the Illinois EPA and the community, U.S. EPA reasonably anticipates that the future use of the Site will be restricted to the current (and historical) use of industrial and commercial. Although a residential scenario was assessed in the Baseline Risk Assessment, it was done for comparison purposes only and is not considered an appropriate future use.

The proposed remedy includes three factors that impact future land use considerations. First, a flexible cover system will be used that will allow for future commercial/industrial development. This approach was chosen because actual future use decisions have not been made, but there is great interest in re-use of the site. The second component of future use is a Soils Management Plan (SMP). The SMP will define the process and procedures for obtaining approval of future commercial/industrial land use options. The third component of future use is the implementation and long-term monitoring and enforcement of formal deed restrictions, zoning change restrictions, easements, covenants and/or deed notices. These restrictions will be developed in the Soils Management Plan and are necessary to ensure that future development does not result in unacceptable exposures or interfere with the long-term operation and maintenance of the remedy.

Ground Water Use

Ground water in the area has historically not been used for drinking water. The installation of drinking water wells will be prohibited for the long-term at this Site. The entity responsible for the implementation, monitoring and enforcement of these restrictions will be identified in the Soils Management Plan and/or Operation and Maintenance Plan. Ground water at the Site will be managed in the long-term as a State of Illinois Groundwater Management Zone.

VI. SUMMARY OF SITE RISKS

A Baseline Risk Assessment consisting of a Human Health Risk Assessment (HHRA) and a screening ecological risk assessment (ERA) for the WCP Site were performed by CH2M Hill for the U.S. EPA (U.S. EPA, 1995a and 1995b). CH2M Hill conducted the risk assessments in accordance with U.S. EPA's guidance, including: "Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual" (U.S. EPA, 1989) and "Risk Assessment Guidance for Superfund: Volume I Environmental Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors, and Part B, Development of Risk-Based Preliminary Remediation Goals (U.S. EPA, 1991), and Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (U.S. EPA 1997). These documents provide the methodology and standard assumptions used for evaluating risk and developing appropriate cleanup standards.

The majority of the Site has been vacant since the demolition of the buildings in the 1972, with

the exception of the northwest and southeast quadrant of the Site. The northwest quadrant is currently being used by Larsen Marine for seasonal boat and boat trailer storage, the southeast quadrant of the Site is currently occupied by OMC's data building, administration building, parking lots, and lawn. There are no known present uses of ground water within the Site boundaries. The existing beach on Lake Michigan, located across Sea Horse Drive from the Site, is an area of potential exposure to contaminated surface water during recreational swimming. There is limited access to the surface water in Waukegan Harbor, and it is expected that exposure to contaminated surface water in the harbor adjacent to the Site would be limited to trespassers. Fish ingestion from contaminated surface water in both Lake Michigan and Waukegan Harbor is also a likely exposure pathway.

Future land use at the Site is likely to be commercial or industrial. The Site is located in an industrial commercial corridor and the majority of the Site is fenced or is directly adjacent to the harbor. For purposes of completeness, the following risk discussion includes a residential land use scenario. The inclusion of the residential scenario is for comparison purposes and is not considered an appropriate present or future Site use.

Exposure to soil was evaluated in the boat storage area, the OMC office building area, and the area of elevated contamination because of the potential for the future and existing uses for these areas to differ from the rest of the Site.

The risk characterization process integrates conservative exposure assumptions and toxicity assessments for the Contaminants of Concern (COCs) into a measurable expression of risk for each exposure scenario. The cancer risk is expressed as a probability of a person developing cancer over the course of his or her lifetime based on residential or industrial land use exposure. Cancer risks from various exposure pathways are assumed to be additive. Excess lifetime cancer risks less than 1×10^{-6} (one-in-one million) are considered acceptable by U.S. EPA. Excess lifetime cancer risks between 1×10^{-4} (one-in-ten thousand) to 1×10^{-6} require U. S. EPA and Illinois EPA (the Agencies) to decide if remediation is necessary to reduce risks and to what levels cleanup will occur. Excess lifetime cancer risks greater than 1×10^{-4} generally require remediation.

For noncarcinogens, potential risks are expressed as a hazard index. A hazard index represents the sum of all ratios of the level of exposure of the contaminants found at the Site to that of contaminants' various reference doses. In general, hazard indices which are less than one are not likely to be associated with any health risks. A hazard index greater than one indicates that there may be a concern for potential health effects resulting from exposure to noncarcinogens.

The Reasonable Maximum Exposure (RME) individual and the less conservative Central Tendency Exposure (CTE) were developed in the risk assessment and are summarized below. The Feasibility Study (FS) developed preliminary remedial goals (PRGs) based on these exposures as well as PRGs, referred to as Target Soil Concentrations (TSC), based on less conservative assumptions than those used in the Baseline Risk Assessment. The TSCs are used

to target soils for active remediation rather than containment approaches.

The estimated risks for the exposure pathways evaluated are presented in Table 3. For the occupational and utility worker scenarios considered to be the reasonable future uses of the site, cancer and/or non-cancer risks exceeded the allowable risk of 1×10^{-4} (4×10^{-3}) and HI of one (8.5). The contaminants most often contributing to the risk are PAHs and arsenic.

An ecological assessment was conducted to evaluate the effects of Site contaminants on terrestrial and aquatic environments within or near the Site. Several Site contaminants (phenols, PAHs and metals) were identified that may potentially pose a risk. However, observable chemical effects on terrestrial and aquatic organisms were not evident, but on-site studies were limited to qualitative observations only.

VII. REMEDIATION OBJECTIVES

Remedial Action Objectives (RAOs) were developed for all the contaminated soils (the PAH, creosote and arsenic contaminated soils), ground water and surface water. RAOs provide a basis for evaluating potential remedial action alternatives.

A. Soils

- ! Protect human health by reducing or eliminating exposure (direct contact, ingestion, inhalation) to soil with concentrations of contaminants representing an excess cancer risk of greater than 1×10^{-6} as a point of departure and a hazard index (HI) greater than 1 for reasonably anticipated future land use scenarios.
- ! Protect the environment by minimizing/eliminating the migration of contaminants in the soil to ground water or to surrounding surface water bodies.
- ! Ensure future beneficial commercial/industrial use of the Site.

The basis and rationale for the soils remediation objectives is protection of reasonable future uses. This includes industrial, commercial and utility worker protection.

B. Ground Water

- ! Protect human health by eliminating exposure (direct contact, ingestion, inhalation) to ground water with concentrations of contaminants in excess of regulatory or risk-based standards.
- ! Protect the environment by controlling the off-site migration of contaminants in the ground water to surrounding surface water bodies which would result in exceedance of ARARs for COCs in surrounding surface waters.

- ! Reducing contaminant levels in ground water to meet MCLs and State of Illinois Drinking Water Standards.

The rationale for the ground water remedial objectives is based on anticipated commercial or industrial land use. These objectives were developed to eliminate exposure and protect against off-site migration of contamination.

C. Surface Water

- ! Protect human health by minimizing exposure (direct contact, ingestion, inhalation) to surface water that has been impacted by Site-related ground water with concentrations of contaminants such that regulatory or risk-based surface water standards have been exceeded.
- ! Protect the environment by controlling the off-site migration of contaminants in the ground water to surrounding surface water bodies which would result in exceedance of ARARs for COCs in surrounding surface waters.
- ! Reducing Site-related contaminant levels in the surface water to meet the State of Illinois Surface Water Quality- Standards.

The basis and rationale for the surface water remedial objectives are to minimize the potential for contaminant exposure to surface water users and reduce migration of ground water to surface water that could result in exceedances of surface water standards.

VIII. DESCRIPTION OF ALTERNATIVES

The remedy evaluation process conducted by U.S. EPA, in consultation with the Illinois EPA, compared a number of different remedial alternatives and a no action alternative. Upon a thorough screening of a wide spectrum of in-situ and ex-situ remedial alternatives, U.S. EPA selected four combined alternatives for detailed analyses and subjected them to evaluation under the National Contingency Plan (NCP) criteria. Although the alternatives are identified as 1 through 4, there were a number of different options within alternatives 2 and 3 (i.e., RCRA landfill disposal versus off-site co-burning soil options). The more conservative costs are presented below (2A and 3A) because specific studies will be required to verify disposal options.

A. Remedial Alternative 1

No action is the absence of any remedial action. No action is considered in this evaluation as a baseline for comparison to all other potential remedial action as required by the National Contingency Plan. This alternative would have no associated costs.

B. Remedial Alternative 2

Vadose Zone Soil Remedial Components

- Excavation of PAH Remediation Zone soil and treatment by power plant co-burning or equivalent process (Figure 13).
- Stabilization/solidification of the Arsenic Remediation Zone soil (Figure 13).
- Asphalt cap for the Marginal Zone soil area.
- Land development restrictions to protect the integrity of the cap, the ground water slurry wall, and the associated storm-water detention basin.

Alternative 2 corresponds to Alternative 2A in the FS. Variations of this alternative are Alternative 2B, which includes disposal of PAH and Arsenic Remediation Zone soils at a Resource Conservation and Recovery Act (RCRA) Subtitle C or D landfill, and Alternative 2C, which includes construction of an on-site containment unit for PAH and Arsenic Remediation Zone soils.

Ground Water Remedial Components

- Containment system on the eastern portion of the Site, consisting of a slurry wall system and interior extraction/drainage units.
- Multiple treatment cells on the beach and on-site near the harbor ground water/surface water interface with reinjection. On-site treatment of ground water includes the reduction of arsenic through precipitation, and the reduction of phenols, organics and ammonia through a biological system (Figure 14).
- Monitored Natural Attenuation for ground water outside the remediation zone and inside the remediation zone after the treatment cells are completed.
- Infiltration reduction in areas capped with asphalt cap, and the lined storm-water detention basin.
- Institutional controls to prevent the installation of potable wells.

The estimated costs for Alternative 2 are

Estimated Capital Cost	\$21,100,000
Present Worth O&M	<u>\$17,800,000</u>
Total Present Worth	\$38,900,000

C. **Remedial Alternative 3**

Vadose Zone Soil Remedial Components

- Excavation of the PAH Remediation Zone soil and off-site treatment by power plant co-burning or equivalent process (Figure 13).
- On-site stabilization/solidification of the Arsenic Remediation Zone soil (Figure 13).
- Vegetative cover for the Marginal Soil Zone, the backfilled excavation areas and the southwest quadrant of the Site (Figure 14).
- Development of institutional controls and a post-remedy soil management plan.

This Alternative corresponds to Alternative 3A in the FS. A variation of this alternative is Alternative 3B, which includes disposal of PAH and Arsenic Remediation Zone soils at a RCRA Subtitle C or D landfill.

Ground Water Remedial Components

- Multiple treatment cells on the beach and on-site near the harbor ground water/surface water interface with reinjection. On-site treatment of ground water includes the reduction of arsenic through precipitation, and the reduction of phenols, organics and ammonia through a biological system. See Figures 14, 15, and 16 for details.
- Monitored Natural Attenuation for ground water outside the remediation zone and inside the remediation zone after the treatment cells are completed.
- Infiltration reduction and direct contact exposure minimization through a combination of vegetative, asphalt, and buildings as covers.
- Institutional controls to prevent the installation of potable wells.

The estimated costs for Alternative 3 are:

Estimated Capital Cost	\$14,100,000
Present Worth O&M	<u>\$10,90,000</u>
Total Present Worth	\$25,000,000

The most significant differences between Alternative 2 and 3 are that Alternative 2 includes the construction of a slurry wall for ground water, the extraction and treatment of ground water from behind the slurry wall, the construction of a detention basin and the installation of an asphalt cap. Alternative 3 does not include a slurry wall or detention basin and has a combination vegetative,

building and asphalt cap over a larger portion of the Site.

D. Remedial Alternative 4

Vadose Zone Soil Remedial Components

- Excavation of PAH Remediation Zone soil and treatment by power plant co-burning or equivalent process.
- Stabilization/solidification of Arsenic Remediation Zone soil.
- Disposal at a RCRA Subtitle D landfill for Marginal Zone.

Ground Water Remedial Components

- Extract ground water at 200 gpm from wells located along the hydraulic divide. Ex-situ treatment includes the removal of arsenic, phenols, organics, ammonia and cyanide prior to discharge to the North Shore Sanitary District. The ground water remediation goal is restoration of the aquifer to drinking water standards.

The estimated costs for Alternative 4 are:

Estimated Capital Cost	\$44,200,000
Present Worth O&M	<u>\$56,500,000</u>
Total Present Worth	\$100,700,000

The most significant differences between Alternative 3 and 4 are that Alternative 4 includes off-site disposal of the Marginal Zone soils and includes site-wide long-term treatment and off-site discharge of ground water.

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

The FS evaluated the relative performance of each remedial alternative using the nine criteria set forth in the NCP at 40 CFR Section 300.430. The ROD then determines which remedial action provides the best balance of trade-offs with respect to the nine criteria.

A. THRESHOLD CRITERIA

1. **Overall protection of human health and the environment-** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- 2., **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)**-describes how the alternative complies with chemical-, location-, and action-specific ARARs, or other criteria, advisories, and guidance.

B. PRIMARY BALANCING CRITERIA

Once an alternative meets the threshold criteria above, the following five criteria are used to compare and evaluate the elements of the alternatives.

1. **Long-term effectiveness and permanence**- evaluates the effectiveness of alternatives in protecting human health and the environment after response objectives have been met, in terms of the magnitude of residual risk and the adequacy and reliability of controls.
2. **Reduction in toxicity, mobility, or volume through treatment**- evaluates the treatment technologies by the degree of expected reduction in toxicity, mobility, or volume of hazardous material. This criterion also evaluates the irreversibility of the treatment process and the type and quantity of residuals remaining after treatment.
3. **Short-term effectiveness** - addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until the remedial action objectives are achieved.
4. **Implementability**- assesses the ability to construct and operate the technology; the reliability of the technology; the ease of undertaking additional remedial actions; and the ability to monitor the effectiveness of the remedy. Administrative feasibility is addressed in terms of the ability to obtain approvals from other agencies. This criterion also evaluates the availability of required resources, such as equipment, facilities, specialists, and capacity.
5. **Cost** - evaluates the capital and operation and maintenance costs of each alternative, and provides an estimate of the total present worth cost of each alternative.

C. MODIFYING CRITERIA

The modifying criteria are used in the final evaluation of remedial alternatives after public comment on the RI/FS and Proposed Plan has been received.

1. **State acceptance** - addresses whether, based on its review of the RI/FS and Proposed Plan, the state concurs with, opposes, or has no comment on the proposed remedial alternative.

The State of Illinois provided comments on the RI/FS and the Proposed Plan and did concur with the Proposed Plan. A letter of concurrence with this ROD is attached in

Appendix C.

2. **Community acceptance** - addresses whether the public concurs with the Proposed Plan. Community acceptance of the Proposed Plan was evaluated based on comments received at the Public Meeting and during the public comment period. This is documented in the Responsiveness Summary presented in Appendix B.

The section below presents the nine criteria and a brief summary of each alternative and its strengths and weaknesses according to the detailed and comparative analyses.

Overall Protection of Human Health and the Environment

The No Action alternative is not protective of human health and the environment for two reasons: (1) unacceptable soil exposure risks, and (2) potential long-term migration of contaminants to the surface water.

Remedial Alternatives 2, 3, and 4 are protective of human health and the environment. These remedies would eliminate direct contact to contaminated soil and minimize the migration of contaminants from soil and ground water to surface water. The protectiveness of these alternatives would be ensured through institutional controls to restrict on-Site ground water use.

The slurry wall in Remedial Alternative 2, however, does not increase the protection of human health and the environment over Alternatives 3 and 4. The long-term requirement to manage the contained ground water through pump and treat could decrease the protection of human health. This is due to the additional exposures caused by the long-term operation and maintenance of the system. Remedial Alternative 4 is very costly and, more importantly, meeting the drinking water standards may be technically impracticable. For these reasons Alternative 4 may not be considered more protective of human health and the environment than the other alternatives.

Compliance with Applicable or Relevant and Appropriate Requirements

As noted above, the No Action alternative does not meet ARARs due to unacceptable surface soil exposures and does not meet ground water ARARs. Remedial Alternatives 2 and 3, on the other hand, are designed to meet ARARs eventually, with active ground water remedies designed to protect the surface water. Both Alternatives 2 and 3 will require an interim waiver of the Federal Underground Injection Control and corresponding State of Illinois regulations. This waiver would be interim for the time period of the active ground water treatment. Alternatives 2 and 3 will not meet Federal MCLs and State Class I and Class II Groundwater Quality Standards until completion of the phase 1 and phase 2 ground water remediation. U.S. EPA anticipates that compliance with MCLs will be achieved outside of the waste boundaries at the Site after phase I and II ground water remediation is completed. A Groundwater Management Zone will be initiated in compliance with the State of Illinois Administrative Code Parts 620 and 740. The Groundwater Management Zone will exempt the designated ground water from meeting the Part

620 standards during the remedial action. If these standards are not achieved upon completion of phase I and II remediation, then Alternative Groundwater Quality Standards may be established by the State pursuant to Part 620 and the Groundwater Management Zone will be withdrawn.

The potential Technical Impracticability of meeting drinking water standards in Remedial Alternative 4 may require the waiver of MCLs and State Groundwater Standards ARARs. Preliminary estimates indicate that the ground water influent for the Alternatives that include the phase 1 pump-and-treat system will be below the RCRA Toxicity Characteristic Leaching Procedure regulatory levels. The contaminants of concern are arsenic and benzene. U.S. EPA anticipates that the arsenic influent will be 4.2 mg/l (below the 0.5 mg/l arsenic TCLP) and benzene will be 0.09 mg/l (below the 0.5 mg/l benzene TCLP). If design investigations indicate that the influent levels will exceed regulatory criteria, the system would be designed to meet the substantive regulatory requirements.

All alternatives except for the No Action alternative will comply with all other ARARs. The FS Report identified, defined, and summarized all potential chemical-, location-, and action-specific ARARs. Tables 7, 8 and 9 of this ROD present an overview of the chemical-specific, location specific, and action-specific ARARs.

Long-term Effectiveness and Permanence

The No Action alternative is currently not protective and would prevent or prolong the recovery of the Site. Remedial Alternatives 2, 3, and 4 provide long-term protectiveness and permanence by removing and capping PAH- and arsenic-impacted soils. Remedial Alternative 3, however, includes the added remedial benefits of an extended phytoremediation cap, which further enhances the long-term effectiveness and permanence of this remedy. Institutional controls in Remedial Alternative 3 also assure future, protective development of the Site. These controls ensure the permanence of the appropriate long-term management of Site activities.

Concerning ground water remedies, Remedial Alternatives 2, 3, and 4 include contaminant removal and flux reduction. Given the potential Technical Impracticability of attaining Class II ground water standards in Remedial Alternative 4, the remaining alternatives (2 and 3) provide equivalent long-term effectiveness and permanence as shown in the ground water mass flux to surface water.

In summary, Remedial Alternative 3 is a technically practicable remedy, which offers equivalent or superior long-term effectiveness compared to Remedial Alternatives 1, 2 and 4. The advantages of Remedial Alternative 3 are due to: (1) a flexible, extended cap with phytoremediation capabilities, (2) a ground water treatment system that can further enhance the in-situ biodegradation of contaminants, and (3) protective institutional controls for soil.

Reduction in Toxicity, Mobility, or Volume through Treatment

The No Action alternative would rely on unenhanced natural attenuation processes to reduce toxicity, mobility, and volume.

Remedial Alternatives 2, 3, and 4 would reduce contaminant toxicity, mobility, and/or volume to various degrees. Remedial Alternative 2 reduces the mobility of contaminants within the slurry wall, but does not decrease their toxicity or volume. The containment unit in Alternative 2C does not reduce toxicity or volume of contaminants. Given the diminishing removal efficiency of pump-and treat systems, Remedial Alternative 4 does not offer an increase in reduction of toxicity, mobility or volume when compared to Remedial Alternatives 2 and 3. Remedial Alternative 3, on the other hand, offers superior reduction in flux to the harbor through the use of a cap system with phytoremediation capabilities. Alternatives 2 and 3 are similar in reduction of mass flux to the lake. Alternative 3 aims at perpetuating these beneficial reductions through managed land use of the Site.

Short-term Effectiveness

The No Action alternative does not require short-term actions to be implemented at the Site. In contrast, Remedial Alternatives 2, 3, and 4 include excavation of contaminated soil. Remedial Alternatives 2 and 3 include capping of remaining soil. Soil removal and capping are proven technologies that can be implemented over a short period of time.

Remedial Alternative 4, however, requires excavation of about 36,000 cubic yards of contaminated soil. This alternative poses significantly more potential for short-term risks than Remedial Alternatives 2 and 3 which include excavation of about 10,000 cubic yards of soil. In the short term, a cap provides an additional layer of protection for the Site to prohibit direct contact, reduce infiltration to ground water, reduce migration of contaminants from soil to ground water and ground water to surface water.

Remedial Alternative 3 is more effective in the short-term (phase 1) for ground water. Under this remedy the ground water treatment goals can be achieved in approximately five to 7 years through the use of the effective cell units. The cap system of this remedy also includes phytoremediation capabilities that will further reduce contaminant flux into the adjacent surface water bodies. In contrast, Remedial Alternative 4, with a static pump-and-treat system, does not have the flexibility to respond to space-time changes of the ground water plume.

Implementability

No implementation is required for the no action alternative. Remedial Alternative 4 is implementable; however, achieving cleanup standards may be technically impracticable.

Remedial Alternatives 2 and 3 are implementable. Excavation of surficial soil and installation of

phytoremediation/asphalt caps can be easily implemented using conventional equipment and standard construction techniques. The phytoremediation cap in Alternative 3 can be changed to asphalt or buildings to maximize future Site development.

The asphalt cap in Remedial Alternative 2 requires a storm water detention basin which limits the implementability of future Site development. Long-term care and maintenance of an asphalt cap system is also easily implemented using standard equipment and procedures.

Cost

The capital, operation and maintenance costs, and net present worth costs are presented for each alternative in the Description of Alternatives (Section VIII). The cost estimates have been developed strictly for comparing the four alternatives. The cost estimates are order-of-magnitude estimates having an intended accuracy range of +50 to -30 percent; the specific details of remedial actions and cost estimates would be refined during design.

The no action alternative has no direct cost. Indirect costs, such as the potential effect on property values or taxes associated with potential remedial actions, are not considered in this study. The capital cost for Remedial Alternative 2 is \$21,100,000 and the operation, maintenance and repair is \$17,800,000. The total present worth cost is \$38,900,000.

The capital cost for Remedial Alternative 3 is \$14,100,000 and the operation, maintenance and repair is \$10,900,000. The total present worth cost is \$25,000,000.

The capital cost for Remedial Alternative 4 is \$44,200,000 and the operation, maintenance and repair is \$56,500,000. The total present worth cost is \$100,700,000. The estimated costs are based on a 30-year time horizon, which is inadequate for attaining Class II ground water standards. Therefore, these costs should be viewed as under-estimated.

State Acceptance

The State of Illinois provided comments on the FS and concurred on the Proposed Plan. A letter of concurrence with this ROD is attached in Appendix C.

Community Acceptance

Community acceptance of the Proposed Plan was evaluated based on comments received at the Public Meeting and during the public comment period. Only one public comment was received at the public meeting. This comment was in support of the use of Alternative 3. The remaining comments were written. These comments and U.S. EPA's response to these comments are documented in the Responsiveness Summary presented in Appendix B.

X. THE SELECTED REMEDY

U.S. EPA has selected a remedy that is a slight modification of Alternative 3. Alternative 3 did not address the creosote contaminated soils in the temporary storage pile on-site, and the selected remedy will require off-site treatment and disposal of these soils. Specifically the selected remedy includes:

A. Vadose Zone Soil Remedial Components

All impacted soils at the Site will be fully managed under the selected remedy. The creosote contaminated soil, and the PAH Remediation zone will be removed and treated or disposed of off-site at a permitted facility. Arsenic contaminated soils will be stabilized/ solidified in place and managed on-site. However, if on-site management interferes with potential future use, this remedy allows for the flexibility to dispose the stabilized/solidified arsenic soils off-site. Areas of lesser contamination (the Marginal Soil Zone and the southwest quadrant of the Site) will be covered by a combination vegetative, asphalt and building cover. Institutional controls and a Soils Management Plan that will allow future protective use of the Site and further ensure the protectiveness of the remedy.

1. Excavation of the PAH Remediation Zone and the temporary storage pile of creosote contaminated soil and either off-site: 1) ²treatment by power plant co-burning, or 2) disposal at a RCRA Subtitle C or D landfill. The PAH Remediation Zone soil will be mixed with coal or other material to improve its material handling characteristics and to ensure it meets the permit requirements of the receiving facility. The PAH Remediation Zone represents the area where the concentrations of PAHs pose a carcinogenic risk exceeding the commercial and industrial or utility/construction risk of 1×10^{-5} using the representative high exposure (RHE) utility worker exposure or hazard index of 1 for noncancer effects. The remedial action objectives for soil included protection of human health from soil with concentrations of contaminants representing an excess cancer risk of 1×10^{-6} as a point of departure. The more conservative 1×10^{-6} risk level, the more conservative reasonable maximum exposure (RME) assumptions and the more conservative residential land use exposure assumptions were not used in defining the areas for excavation and treatment. USEPA believes the exposure levels and exposure assumptions used in identifying the areas for active remediation are reasonable given the potential for future site use.

The Soil Cleanup Levels are presented in Table 4. The PAH Remediation Zone represents an estimated in-place soil volume of between 7,100 and 14,900 cubic yards (cy). The exact amount of PAH Remediation Zone soil requiring off-Site treatment/disposal will be based on actual field data. The temporary creosote contaminated soil pile is currently covered and routinely inspected. This volume is estimated to be approximately 4,500 cubic yards and will

²Treatment is the preferred alternative for both the PAH and arsenic contaminated soils. Placement of the PAH soils in a landfill will only be selected if it is determined during the Remedial Design that treatment is not practicable (e.g., not feasible, excessive cost, etc.).

be removed in its entirety (Figure 13). This will add \$1,500,000 to the capital cost of the remedy.

2. In-situ stabilization/solidification of the Arsenic Remediation Zone. The extent of the solidification will be protective to a 10^{-5} cancer risk using the representative high exposure (RHE) utility worker exposure. The remedial action objectives for soil included protection of human health from soil with concentrations of contaminants representing an excess cancer risk of 1×10^{-6} as a point of departure. The more conservative reasonable maximum exposure (RME) assumptions and the more conservative residential land use exposure assumptions were not used in defining the areas for stabilization/solidification. USEPA believes the exposure levels and exposure assumptions used in identifying the areas for active remediation are reasonable given the potential for future site use.

Arsenic Soil Cleanup Levels are presented in Table 4. The total volume of the Arsenic Remediation Zone is estimated to be between 3,300 and 7,200 cubic yards of soil. The exact amount of soil requiring on-site solidification will be based on actual field data. If U.S. EPA determines that on-site management interferes with future use, the remedy allows the flexibility for off-site disposal of the stabilized/solidified arsenic soils in compliance with all regulatory requirements (Figure 13).

3. Combination vegetative, asphalt and building cover for Marginal Zone soil, the backfilled excavation areas and the southwest quadrant of the Site to minimize infiltration, manage surface water drainage/erosion control, enhance in-situ degradation of low-level residual soil organic contaminants and provide a barrier from direct contact exposure. The Marginal Zones are situated both around and over the PAH and arsenic remediation zones. The vegetative cover will result in an industrial Site-wide cancer risk of 10^{-6} or less (Figure 14).
4. Development of institutional controls. Within the Soils Management Plan described in section 5 below, appropriate site use restrictions (i.e., zoning), deed notifications, ground water use prohibitions and easements/covenants will be placed on the Site limiting its use to industrial/commercial and uses that will not adversely impact the remedy. The Soils Management Plan will allow for future redevelopment but additional work may be required to change from industrial/commercial land use. Ground water use will be prohibited until such time that ground water meets the Federal and State drinking water standards.
5. Development of a comprehensive Soil Management Plan. The purpose of this document is to clearly delineate the testing requirements and the process and procedures for approving future uses/development of the Site. This plan will allow flexibility for future development and allow evaluation of their potential impact on the remedy (on-site treatment plant, infiltration, vegetative cover, storm water and erosion control, direct exposure and treatment of low level residual soil contamination). This plan will also delineate who will be required to implement, monitor and enforce all required institutional controls.

B. Ground Water Remedial Components

The ground water remedy is a combination of a short-term (phase 1) ground water extraction and an on-site treatment/reinfiltration system along with a long-term Monitored Natural Attenuation (phase 2) remedy (Figure 14). The short-term (phase 1) ground water remedy is aimed at contaminant mass removal in the short-term that will provide long-term protection of nearby surface water bodies. The effectiveness and protectiveness of the short-term (phase 1) ground water remedy are further ensured after treatment through long-term Monitored Natural Attenuation. The short-term (phase 1) ground water treatment and the Monitored Natural Attenuation ground water remedy will meet the very long-term objective of meeting ground water standards and preventing exceedance of surface water standards. Ground water standards are presented in Table 5 and surface water standards are presented in Table 6. Exposure to contaminated ground water during and after the implementation of the remedy will be restricted through long-term institutional controls.

1. **Short-term (phase 1) ground water removal and on-site treatment/reinfiltration.** Ground water will be removed and treated through a mobile, cell-based, low-flow extraction system. The cells will be sequentially operated. Each cell will treat the ground water within an approximately one-half-acre zone until ground water within the treatment area is adequately flushed. Although the exact number of wells and cells required will be determined in the Remedial Design, preliminary cell design includes 10 extraction wells and 20 reinfiltration wells per cell and an estimated 20 individual cells. The areal extent of the plume to be treated by the moveable cells, the cell design, and the optimum number of pore volume treatments will be based on both current data and pre-design investigations and pilot testing. The areal extent will be optimized based on protection against exceedances of surface water standards from ground water to surface water discharges and practical construction limitations (e.g., constructing and operating cells on the beach).
2. **Ground water treatment.** The extracted water will be treated on-site for arsenic, organics, phenols, and ammonia and will be reinjected through wells along the perimeter of cells. The performance goal is an 80% reduction in contaminant mass at the base of the aquifer. In the event the conditions in the field grossly retard treatment, a critical evaluation of cell treatment will occur after the completion of four pore volumes on any individual cell. This ground water cell treatment/reinfiltration process is expected to take six to twelve months per cell and will be expedited by simultaneous operation of four treatment cells. The ground water treatment is expected to be accomplished within six years and will be followed by Monitored Natural Attenuation,
3. **Waiver of the UIC prohibition.** The Preferred Alternative will require a waiver of the UIC prohibition of reinjection of liquids into the formation from which they were removed at concentrations exceeding MCLs. The Preferred Alternative requires

reinjection to increase the removal rate of contamination and to enhance the ground water nutrient chemistry by adding nitrate and oxygen to ground water. This nitrate addition and oxygenation will stimulate microbial degradation of residual contamination in the aquifer. The U.S. EPA will invoke the interim action ARAR waiver of the NCP for the six years the short-term (phase 1) ground water system operates to allow largely for the re-infiltration of nitrate.

4. **Long-term Monitored Natural Attenuation.** The Monitored Natural Attenuation ground water remedy will meet the very long-term objective of meeting ground water standards presented in Table 5 by allowing natural processes to remediate the contaminants both during and after treatment. Monitored Natural Attenuation will be conducted in all areas within the plume outside the short-term (phase 1) ground water zone of treatment and within the treatment zone after the cell treatment has occurred. A three stage laboratory microcosm study of Site ground water was completed to assist in understanding the mechanics and feasibility of Monitored Natural Attenuation. The conclusion of the report was that intrinsic bioremediation is applicable once the high concentrations of contaminants are reduced by 33%. Further, U.S. EPA anticipates that nitrate and oxygen introduced from the short-term (phase 1) system will enhance intrinsic biodegradation. Previously the treated areas held inhibitive concentrations of contaminants. Once the inhibitive concentrations of contaminants have been removed and the nitrate source and oxygenation from treatment reinjection is available in the aquifer, degradation should occur. Long-term ground water monitoring will be directly compared to the projections developed in a Monitored Natural Attenuation Study. This study will be completed in the future and includes sampling to; 1) document ongoing reductions in contaminant concentrations, 2) show the presence of contaminant daughter products 3) show the presence of terminal electron donors/acceptors, 4) determine the amount of dilution occurring within the plume with conservative tracers, and 5) allow multi-dimensional plume modeling. U.S. EPA anticipates that approximately 90 years will be required to meet the ground water standards. Projections of the natural attenuation of the plume made during the Natural Attenuation Study will be critically evaluated over time in comparison to actual long-term ground water sampling data. The entire ground water plume area will be managed as a Groundwater Management Zone pursuant to the requirements of Illinois Administrative Code.

If data show that the ground water will not be remediated in a reasonable amount of time, additional measures may be necessary at this Site. U.S. EPA, in consultation with the Illinois EPA, will determine if additional work is needed based on an evaluation of the following criteria; 1) data that shows that the ground water will not be remediated in a reasonable amount of time, 2) comparison of existing contaminant levels throughout the plume to MCLs; 3) overall protection of surface water; 4) trends in contaminant concentrations, if any, as compared to Natural Attenuation Study projections; 5) effectiveness of the source control measures at cutting off the source of

contamination at the Site; 6) potential reduction in restoration time frames; 7) potential for the contaminants concentrations in the ground water to reach appropriate levels throughout the plume; and 8) alternative remedial measures available to meet ground water standards and the cost thereof. Additional measures may be necessary if an evaluation of the above criteria indicates: 1) concentrations have not decreased; 2) surface water standards are being exceeded as a result of ground water discharges to surface water; 3) concentrations do not show the potential to decrease; or 4) source control measures do not meet their remedial objectives of minimizing off-site contaminant migration. These additional activities are likely to involve more data collection, additional treatment design or other technically practicable remedial measures, including evaluations of any applicable new technology. The design of additional technically practicable measures (should they be necessary) may include: locating ground water extraction wells (or other remedies) to maximize hydraulic capture of the plume and additional on-site treatment, as appropriate.

5. **Long-term Monitoring.** Long term monitoring of ground water and surface water will be conducted to monitor and ensure the effectiveness of the remedy. Monitoring results will be evaluated annually to aid in predicting contaminant trends. The monitoring program to be developed during the design phase will include: identification of locations to monitor changes in both the horizontal and vertical extent of contamination; establishing the required sampling frequency and parameters; identification and monitoring of areas containing higher contaminant concentrations; and a requirement for providing a continuous monitoring record. Long-term ground water and surface monitoring will be required to determine if the combination of the soil removal, vegetative, asphalt and building cover, and ground water treatment are resulting in reductions in ground water and surface water contaminant concentrations.
6. **Five-Year Reviews.** U.S. EPA will formally evaluate all components to determine the effectiveness of the selected remedy (e.g., cover, ground water treatment, and long-term Natural Attenuation of Ground water) as part of the five-year review process (five-year reviews are required for sites where wastes are left on-site). If the data available at the first five-year review is insufficient for a reliable trend analysis, evaluation of remedy performance will be completed in the subsequent review or at some earlier time to be established during the initial five-year review. An evaluation of information gathered for each five-year review will be used to determine whether or not there is a need for additional actions to reduce cleanup times. The ground water cleanup must be achieved within a reasonable period of time. For this type of situation, a reasonable period of time for meeting the MCLs can be defined as not significantly longer than active treatment across the entire plume.

The final estimated costs for the Selected remedy are:

Present Worth of FS Alternative 3 (5% Discount Rate)	\$25,000,000
Creosote Soils	<u>\$1,500,000</u>
FINAL PRESENT WORTH	\$26,500,000

XI. STATUTORY DETERMINATIONS

The selected remedy for the WCP Site is consistent with CERCLA and in compliance with the NCP to the extent practicable. The selected remedy is protective of human health and the environment, attains ARARs over the long-term, and is cost-effective. The selected remedy also satisfies the statutory preference for treatment that permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances as a principal element. The following describes how the selected remedy meets these requirements.

A. The Selected Remedy is Protective of Human Health and the Environment

The selected remedy will provide adequate protection of human health and the environment through treatment, containment and institutional controls to prevent exposures to soil and ground water. The technologies and controls will eliminate direct contact to contaminated soil and minimize the migration of contaminants from soil via ground water to surface water. Treatment of the contaminated ground water combined with institutional controls to restrict on-site ground water use will reduce risks associated with the ground water plume and minimize the potential for exceedance of surface water standards. The potential future risks associated with access to/use of Site ground water will decrease over time because Natural Attenuation will reduce the concentration of contaminants.

B. The Selected Remedy Attains ARARs

After completion of the Phase I and Phase II ground water remediation, the selected remedy will comply with identified federal and state ARARs. Potential chemical-, location-, and action specific ARARs were identified, defined, and summarized in the FS report. Tables 7, 8 and 9 of this ROD present an overview of the chemical-specific, location-specific, and action-specific ARARs for the selected remedy. Activities associated with the selected remedy will be conducted according to regulations outlined by OSHA.

The selected remedy will require a waiver of the federal and State UIC regulations which prohibit the reinjection of liquids at concentrations exceeding MCLs. The reinjection is necessary to increase the removal rate of contamination and to enhance the ground water nutrient chemistry by adding nitrate and oxygen to the ground water. This nitrate addition and oxygenation will stimulate microbial degradation of residual contamination in the aquifer. The U.S. EPA will invoke the interim action ARAR waiver of the NCP for the approximately 6 years the short-term (phase 1) ground water system operates.

The entire ground water plume area will be managed as a Groundwater Management Zone pursuant to the requirements of Illinois Administrative Code (IAC). The IAC Part 740, Section 740.530 provides for the automatic establishment of a Groundwater Management Zone (GMZ) for approved remedial action plans. A GMZ (35 IAC 620.250) is established for ground water being managed to mitigate impairment caused by the release of contaminants from a Site.

During the period of ground water management, the ground water within a GMZ is exempt from the Class I through IV standards. If data shows that the ground water will not be remediated in a reasonable amount of time, additional measures may be necessary at this Site. These additional activities are likely to involve more data collection, additional treatment design or other remedial measures, including evaluations of any applicable new technology. The applicability of new technologies will be evaluated in terms of technical and economic feasibility. The design of additional measures (should they be necessary) may include: locating ground water extraction wells (or other remedies) to maximize hydraulic capture of the plume and additional on-site treatment, as appropriate. After remediation, concentrations within a GMZ may exceed the ground water standards if, to the extent practicable, the exceedance has been minimized and beneficial use has been returned and any threat to public health or the environment has been minimized.

C. The Selected Remedy is Cost-Effective

The remedy provides overall effectiveness proportionate to its cost. The estimated costs associated with this remedy are:

PRESENT WORTH	\$26,500,000
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The No Action alternative is less costly, but it would not provide protection from the current and potential future risks associated with soil and ground water exposure. Alternative 2 has a present worth of \$38,900,000, which is considerably more costly than the selected remedy. Alternative 4- Aquifer restoration has an excessively high present worth cost of \$100,700,000.

The selected remedy affords overall effectiveness when measured against CERCLA Section 121 criteria and the NCP's nine evaluation criteria, and costs are proportionate to the protection that will be achieved.

D. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner at the WCP Site. The remedy permanently removes the contaminants from the natural environment in the following manner:

1. PAH Soil Remediation Zone and stockpiled creosote soils are excavated and removed from the Site. Treatment through co-burning at a power plant may be used and would result in the permanent destruction of the PAH contaminants. Otherwise the soils will be disposed in a secure landfill.
2. The vegetative cover will minimize infiltration, manage surface water drainage/erosion control, and provide a barrier from exposure. It will also provide permanent treatment by enhancing in-situ degradation of low-level residual soil organic contaminants.
3. Ground water is collected, treated and reinjected on-site. The majority of ground water contaminants will be permanently removed from the ground water.
4. Natural attenuation will be augmented through the introduction of oxygen and nitrate into the ground water plume. The enhanced natural biodegradation will result in the destruction of additional contaminants not otherwise treated during the short-term (phase 1) ground water treatment system.

The selected remedy provides the most permanent solution practicable, proportionate to cost.

E. The Selected Remedy Satisfies the Preference for Treatment that Permanently and Significantly Reduces the Toxicity, Mobility, or Volume of the Hazardous Substances as a Principal Element

The principal elements of the selected remedy include treatment that permanently and significantly reduces the toxicity, mobility, and volume of hazardous substances:

PAH Remediation Zone may be treated through co-burning at a power plant and the creosote soils will be treated and/or disposed of off-site.

1. The vegetative cover will provide permanent treatment by enhancing in-situ degradation of low-level residual soil organic contaminants.
2. Arsenic-contaminated soils will be solidified in-situ to prevent migration and will be covered to prevent direct contact.
3. Ground water is collected and treated. The majority of ground water contaminants will be permanently removed from the ground water.
4. Natural attenuation will be augmented through the introduction of oxygen and nitrate into the ground water plume. The enhanced natural biodegradation will result in the destruction of additional contaminants not otherwise treated during the short-term (phase 1) ground water treatment system.

The selected remedy includes treatment as a principal element and will significantly reduce the toxicity, mobility and volume of hazardous substances.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

The only change from the recommended alternative described in the proposed plan is the flexibility to treat and dispose of the arsenic solidified/stabilized soils off-site if the on-site management interferes with future use.

TABLES

Table 1
Generalized Vertical Distribution of Chemicals in Groundwater

Depth of Soil (feet)	Average Concentration ¹ and Range of Concentrations ²									
	PAHs		Phenol		Benzene		Arsenic		Cyanide	
	Soil (mg/kg)	Groundwater (mg/L)	Soil (mg/kg)	Groundwater (mg/L)	Soil (mg/kg)	Groundwater (mg/L)	Soil (mg/kg)	Groundwater (mg/L)	Soil (mg/kg)	Groundwater (mg/L)
0–4.5 (vadose zone)	1900 (ND–76,000)	–	1.2³ (ND–41 ³)	–	1.2 (ND–62)	–	102 (ND–1800)	–	54 (ND–1400)	–
4.5–21.5 (shallow portion of the sand aquifer)	300 (ND–20,000)	0.58 (1.1 x 10 ⁻⁵ –2.4)	1.6 (ND–110)	0.045 (ND–0.45)	0.016⁴ (ND–0.68 ⁴)	0.0093 (ND–0.07)	27 (1.4–760)	0.32 (ND–4.1)	1.6 (ND–52)	0.056 (ND–0.65)
21.5–base of sand aquifer (deep portion of the sand aquifer)	4.0 (ND–180)	0.32 (7.4 x 10 ⁻⁶ –1.4)	68 (ND–310)	240 (ND–1500)	0.049 (ND–0.8)	1.1 (ND–7.8)	26 (1.2–250)	11 (0.0041–70)	0.69 (ND–4.1)	0.32 (0.0028–0.71)

¹The arithmetic mean (average) is shown in bold on the table. Averages are computed on the 1992–1993 data. Groundwater data to the north of the site are not included in the arithmetic mean calculation.

²The range is represented by the data within the fenceline of the site to the north and south, the harbor on the west and the shoreline of Lake Michigan to the east.

³SB50 at 950 mg/kg phenol was eliminated from arithmetic mean calculation and range. Including this data point gives a mean of 12.0 mg/kg and a range of ND-950 mg/kg. This single data point is identified as an outlier.

⁴TT1001 at 31 mg/kg benzene was eliminated from arithmetic mean calculation and range. Including this data point gives a mean of 0.32 mg/kg and a range of ND-31 mg/kg. This single data point is identified as an outlier.

– Not applicable

Table 2

Computed Surface Water Quality (Assuring Maximum Projected Groundwater Loading)

	Mixing Ratio	Surface Water Concentration ¹		
		Arsenic (µg/L)	Phenols (µg/L)	Ammonia (µg/L)
Lake Michigan Basin Water Quality Standards		148 chronic 340 acute	100	15,000²
Waukegan Harbor, Calculated Water Quality	High (6,200:1)	0.20	4.5	30
	Average (1,600:1)	0.79	18	110
	Low (800:1)	1.6	36	220
Breakwater Area, Calculated Water Quality	High (32,000:1)	0.14	0.61	4.2
	Average (7,600:1)	0.58	2.6	18
	Low (1,600:1)	2.8	13	88
Lake Michigan Open Waters Water Quality Standards		50	1	20
Lake Michigan East of Site, Calculated Water Quality	High (22,000:1)	0.23	3.1	8.4
	Average (12,000:1)	0.44	5.9	16
	Low (2,900:1)	1.7	23	64
Longshore Current Zone, Calculated Water Quality	High (90,000:1)	0.032	0.40	1.5
	Average (50,000:1)	0.062	0.77	2.9
	Low (9,000:1)	0.34	4.2	16
National Ambient Water Quality Criteria for the Protection of Aquatic Life	—	190 chronic	117 chronic	1,490 chronic
		360 acute	2,010 acute	2,600 acute

¹ The computed surface water concentrations are highly conservative because, in addition to using the peak groundwater mass flux, they do not account for natural attenuation mechanisms that remove mass, such as anaerobic biodegradation, aerobic biodegradation, adsorption, and chemical changes.

² In addition, un-ionized ammonia nitrogen must meet the following acute and chronic standards: April through October, acute 330 µg/L, chronic 57 µg/L; November through March, acute 140 µg/L, chronic 25 µg/L.

Table 3

Summary of Estimated Site Human Health Risks

Exposed Population	RME Cancer Risk	CTE Cancer Risk	RME Noncancer Risk HI	CTE Noncancer Risk HI
Boatworkers exposed to surface soil	5×10^{-5}	2×10^{-5}	< 0.1	<0.1
Adolescent trespassers exposed to surface soil	7×10^{-5}	2×10^{-5}	< 0.1	< 0.1
Utility workers exposed to subsurface soils in the OMC office building area	4×10^{-8}	4×10^{-9}	< 0.1	< 0.1
Occupational Adult exposed to subsurface soils	4×10^{-4}	7×10^{-5}	0.25	< 0.1
Residential children exposed to subsurface soils	2×10^{-3}	6×10^{-4}	3.7	1.0
Adolescent trespassers exposed to subsurface soils	3×10^{-5}	6×10^{-6}	< 0.1	< 0.1
Occupational Adult exposed to subsurface soils in area of elevated contamination	4×10^{-3}	8×10^{-4}	8.5	2.0
Residential children exposed to subsurface soils in area of elevated contamination	3×10^{-2}	7×10^{-3}	63	14
Utility workers exposed to subsurface soils in area of elevated contamination	8×10^{-6}	1×10^{-6}	2.0	0.4
Future residential children and adults ingesting groundwater ¹			Lethal acute risk due to arsenic	Lethal acute risk due to arsenic
Utility workers exposed to groundwater	6×10^{-6}	5×10^{-7}	0.21	<0.1
Recreational swimmers exposed to Lake Michigan surface water	$< 1 \times 10^{-7}$	Not calculated	<0.1	Not calculated
Adult subsistence fishermen ingesting fish from Lake Michigan ²	3×10^{-6}	2×10^{-5}	<0.1	<0.1
Adolescent recreational fishermen ingesting fish from Lake Michigan ²	2×10^{-8}	4×10^{-10}	<0.1	<0.1
Current adult subsistence fishermen ingesting fish from Waukegan Harbor ²	9×10^{-6}	5×10^{-7}	2.2	0.44
Current child subsistence fishermen ingesting fish from Waukegan Harbor ²	3×10^{-6}	7×10^{-7}	4.1	0.83
Future adult subsistence fishermen ingesting fish from Waukegan Harbor ²	2×10^{-5}	6×10^{-7}	0.74	0.31
Future child subsistence fishermen ingesting fish from Waukegan Harbor ²	8×10^{-6}	8×10^{-7}	1.4	0.58

Notes:

¹Due to the acute toxicity of the exposure point concentrations, a quantitative risk is not presented.

²Arsenic is the primary contributor to carcinogenic risk from fish ingestion. Calculated risk is likely an overestimate because the amount of additional arsenic intake from fish is a small percent of normal daily arsenic intake. Also estimated future surface water concentrations may be overestimated because of attenuation due to adsorption onto aquifer solids and greater dilution than that assumed.

Table 4

**Soil Cleanup Levels
For Excavation of PAH Remediation Zone and
In-Situ Stabilization of Arsenic Zone
Waukegan Manufactured Gas and Coke Plant Site
(concentrations in mg/kg)**

	Commercial/ Industrial	Utility/ Construction
	RHE	RHE
Arsenic Cancer Risk: 1×10^{-5}	2,050	940
Benzo(a)anthracene 1×10^{-5}	1,500	1,160
Benzo(a)pyrene 1×10^{-5}	150	116
Benzo(b)fluoranthene 1×10^{-5}	1,500	1,160
Dibenzo(a,h)anthracene 1×10^{-5}	150	116
Indeno(g,h,i)pyrene 1×10^{-5}	1,500	1,160
Dibenzofuran Non-Cancer Risk: HI=1	NA	5,390
4-Methylphenol Non-Cancer Risk: HI=1	NA	6,738
Naphthalene Non-Cancer Risk: HI=1	NA	48,556

RHE - Representative high exposure

Table 5

**Groundwater Standards
Waukegan Manufactured Gas and Coke Plant Site
(concentrations in µg/L)**

	MCLs^a	IGQS^b	
		Class I	Class II
Benzene	5	5	25
Ethylbenzene	700	700	1000
Toluene	1000	1000	2500
Xylenes (total)	10000	10000	10000
BETX		11705	13525
Phenols		100	100
Benzo(a)pyrene	0.2	0.2	2
PCBs ^c		0.5	2.5
Arsenic	50	50	200
Cadmium	5	5	50
Cyanide	200	200	600
Lead		7.5	100
Mercury		2	10
Selenium	50	50	50

^a MCLs—Maximum Contaminant Level

^b IGQS—Illinois Groundwater Quality Standards
Class I Section 620.410—Potable Resource Groundwater
Class II Section 620.420—General Resource Groundwater

^c PCB-1248 is the isomer that has been detected at the WCP site.

Table 6

Surface Water Standards
Waukegan Manufactured Gas and Coke Plant Site
(concentration in Fg/L)

Chemical	ARARs								
	FAWQC ^a		Illinois Water Quality Satndard ^b						
			Subpart E: Lake Michigan Basin (Harbor and Breakwater Areas)					Subpart C Public & Food Processing ^d	Subpart E: Open Waters of the Lake Michigan Basin
	Acute	Chronic	Acute	Chronic	Human Health Standard	Wildlife Standard	Standard		
Ammonia as N	14,900	2,600					15,000		20
Ammonia as N, un-ionized ^f			330/140	57/25					
Arsenic	360	190							50
Arsenic (III)	360	190	340	148				50	
Arsenic (V)	850								
Cadmium	5.6	1.4	6.4 c	3.1 c				10	
Cyanide, weak and dissociable	22	5.2	22	5.2					
Cyanide, total									
Lead	121	4.7	180 c	9.5 c				50	50
Mercury	2.4		1.7	0.91	0.0018	0.0013			
Thiocyanate									
Selenium	20	5	d	5.0			1,000	10	10
Benzene					310				12
Ethylbenzene			216	17.2					
Toluene					51,000				5,600
Xylene			1,500	117					
PCBs ^e					0.0000067	0.00012			

Table 6 (continued)

**Surface Water Standards
Waukegan Manufactured Gas and Coke Plant Site
(continued in Fg/L)**

Phenols							100	1	1
Phenol									
o-Cresol (2-methylphenol)									
p-Cresol (4-methylphenol)									
2,4-Dimethylphenol					8,700				450
Acenaphthene	80	23							
Acenaphthylene									
Anthracene									
Benzo(a)anthracene									
Benzo(b)fluoranthene									
Benzo(g,h,i)perylene									
Benzo(k)fluoranthene									
Carbazole									
Chrysene									
Dibenzo(a,h)anthracene									
Dibenzofuran									
Fluoranthene	33.6	6.16							
Fluorene									
Indeno(1,2,3-cd)									
2-Methylnaphthalene									
Naphthalene									
Phenanthrene									
Pyrene									

- a Federal Ambient Water Quality Criteria (FAWQC) for the protection of aquatic life.
- b Illinois Water Quality Standard—35 Ill. Adm. Code Subtitle C, Chapter 1, Parts 302 and 303.
- c Based on hardness. Hardness assumed to be 136 mg/L based on RI surface water sample data.
- d IEPA is awaiting new value.
- e Bioaccumulative
- f Seasonal dependence: first value is for April–October, second is for November–March

Table 7

**Chemical-Specific ARARs
Waukegan Manufactured Gas and Coke Plant Site**

Regulation	Requirement	ARAR Status	Analysis
Soil and Grounwater			
35 Illinois Administrative Code, Part 742, Tiered Approach to Corrective Action Objectives (TACO)	TACO establishes a framework for determining soil cleanup standards, for developing groundwater quality objectives, and for establishing institutional controls.	To be considered.	Provides guidance for development of site-specific soil and groundwater remediation objectives.
TSCA	Establishes requirements and thresholds for management of PCBs.	Relevant and appropriate.	TSCA is relevant and appropriate to defining the management of PCBs in soils.
CERCLA Guidance Land Use in the CERCLA Remedy Selection Process	Establishes appropriate considerations in defining future land use.	To be considered	Provides guidance to EPA in selecting land use for remedy selection purposes.
Groundwater			
Safe Drinking Water Act (SDWA)— Maximum Contaminant Levels (MCLs) 40 CFR 141.61 (organic chemicals) 40 CFR 141.62 (inorganic chemicals)	CERCLA 121(d) states that a remedial action will attain a level under the SDWA. MCLs are enforceable maximum permissible level of a contaminant which is delivered to any of a public water system.	Relevant and appropriate	MCLs are relevant and appropriate for potential drinking water sources by EPA policy (see NCP). Remedies may not have to demonstrate compliance with an ARAR that is technically impracticable (see NCP).
SWDA—Maximum Contaminant Level Goals (MCLGs) 40 CFR 141.50 (organic chemicals) 40 CFR 141.51 (inorganic chemicals)	CERCLA 121(d)(2)(A) states that a remedial action attain MCLGs where relevant and appropriate. MCLGs are non-enforceable health goals under the SDWA.	Relevant and Appropriate	Non-zero MCLGs may be relevant and appropriate. MCLGs equal to zero are not appropriate for cleanup of groundwater or surface water at CERCLA sites by EPA policy (see NCP).
SDWA—Secondary MCLs (SMCLs) 40 CFR 143	Non-enforceable limits intended as guidelines for use by states in regulating water supplies.	To be considered.	SMCLs may be considered if drinking water use of aquifer is considered feasible.
Office of drinking water. Drinking water health advisories.	Guidance levels for drinking water issued by Office of Drinking Water.	To be considered.	May be used for chemicals without MCLs if groundwater is to meet drinking water quality.
Illinois Water Quality Standards (IWQS) 35 Illinois Administrative Code 620	Groundwater must meet the standards appropriate to the groundwater's class as specific in Subpart D/Section 620.401-440.	See specific category	See specific category.

Table 7 (Continued)

**Chemical-Specific ARARs
Waukegan Manufactured Gas and Coke Plant Site.**

– IWQS Class I: Potable Resource Groundwater (Section 620.210;620.410)	Standards for potential potable water supply.	Relevant and appropriate.	Relevant and appropriate if groundwater were designed for potable water use. Not applicable to groundwater 10 feet or less from ground surface.
– IWQS Class II: General Resources Groundwater (Section 620.220; 620.420)	Applicable to groundwater compatible with agricultural, industrial, recreational, or beneficial uses and not in Classes I, III, or IV.	Relevant and appropriate.	Relevant and appropriate to groundwater 10 feet or less from ground surface, or if groundwater is not designated for potable use.
– Alternative Groundwater Quality Standards - Groundwater Quality – Restoration Standards (Section 620.450(a))	Applies to groundwater within a groundwater management zone. May allow concentrations higher than designated use after remediation.	Relevant and appropriate.	May be relevant and appropriate where institutional controls prohibit use of groundwater.
– Guidance for Evaluating the Technical Impracticability of Ground-water Restoration, OSWER Directive No. 9234.2-25, dated September 1993.	Applies to groundwater at concentrated sites. Establishes criteria for assessing the technical impracticability of groundwater remediation.	To be considered.	Conditions at the site make the groundwater restoration technically impracticable.
Surface Water			
Illinois Water Quality Standards Illinois Administrative Code, Title 35, Subtitle C, Chapter 1, Parts 302 and 303	Section 11 environmental Protection Act - regulation to restore , maintain, and enhance purity of the water of the state.	See specific category.	See specific category
– Part 302, General Use - Subpart B Sections 302.201-212	Waters of state for which there is no specific designation <ul style="list-style-type: none"> • acute standards apply within mixing zone • chronic apply after mixing zone 	Relevant and appropriate.	For Illinois surface waters
– Part 302, Public and food processing water supply—Subpart C; Sections 302.301-305	Applies to water of state designated for waters drawn for treatment and distribution as a potable supply or food processing at the point of withdrawal.	Relevant and appropriate.	For Lake Michigan at point of water withdrawal
– Part 302, Subpart E: Lake Michigan Water Quality Standards. Section 302.501-509	Applicable to waters of Lake Michigan and the Lake Michigan Basin.	Relevant and appropriate	Subpart E is for Lake Michigan
– Part 303, Subpart C: Specific Use Designations and Site Specific Water Quality Standards, Section 303.443	Defines standards for “open waters” and “other waters” of the lake Michigan Basin.	Relevant and appropriate.	Lake Michigan Basin standards are relevant and appropriate to the harbor and lake adjacent to the site.
Great Lakes Initiative, Clean Water Act 33 U.S.C. §§ 1251-1387 at 33 U.S.C. 1268, as amended by the Great Lakes Critical Programs Act (Public Law 101-546)	GLI establishes water quality standards, antidegradation policies, and implementation procedures with which state standards must comply for waters in the Great Lakes System	Relevant and appropriate.	GLI establishes the basis for Illinois State Standards for Lake Michigan water quality.

Table 8

**Location-Specific ARARs
Waukegan manufactured Gas and Coke Plant Site**

Location-Specific Concern	Requirement	Prerequisite	Citation	ARAR Status	Analysis
Waters of the United States	A permit is required for work in or affecting navigable waters of the U.S. This includes dredging, disposal of fill material, filling or modification of said waters below the ordinary high water level (OHWL).	Waters which are presently used or have been used in the past or may be susceptible for use to transport interstate or foreign commerce.	Section 10 of the Rivers and Harbors Act. 33CFR Part 332.	ARAR	Site is adjacent to a harbor.
Consent decree for the Outboard Marine Corporation/Waukegan Harbor site	Actions must be considered with the Consent Decree and Record of Decision (as amended) for the Waukegan Harbor site	The Consent Decree became effective April 27, 1989.	Outboard Marine Corporation/Waukegan Harbor site court administered consent decree in the case of the United States of America and the People of the State of Illinois v. OMC	Potentially applicable	Establishes site use restrictions for operation of hazardous waste storage units, land transfer restrictions, and sets PCB remediation standards.

Table 9
Development of Action-Specific ARARs
Waukegan Manufactured Gas and Coke Plant

Regulations	Alternative 2 Disposal			Alternative 3 Removal		Alternative 4 Aquifer Restoration
	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3A	Alt. 3B	
Federal Requirements						
Clean Air Act						
National Ambient air Quality Standards (NAAQS) Section 109 (40 CFR 50) NAAQS specify the maximum concentration of the pollutant which is to be permitted in the ambient air, as average over a specified time period. NAAQS created for carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. Preconstruction review for new sources.	Relevant and appropriate to remedial actions that include emissions to the atmosphere. On-site CERCLA actions are exempt from permitting; however, the remedial action is obligated to comply with the substantive requirements of air regulations and emissions standards.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
State Implementation Plan (SIP) Section 110 (40 CFR 51) Development of SIP for implementation, maintenance, and enforcement of NAAQS in air quality control regions. State sets requirements for emission sources in order to achieve NAAQS.	Not ARAR. State air regulations developed under SIP.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Resources Conservation and Recovery Act (RCRA)						
RCRA - In General 42 U.S.C. 6901 Requirements for management of solid and hazardous waste.	Relevant and appropriate for on-site actions. May be applicable off-site actions if hazardous waste is shipped off-site	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A

Table 9 (Continued)

**Development of Action-Specific ARARs
Waukegan Manufactured Gas And Coke Plant**

RCRA Subtitle C						
Hazardous Waste Management System 40 CFR 260 Management of generation, treatment storage, disposal, and transport of hazardous waste. State of Illinois administers RCRA in Illinois. Refer to State ARARs. Refer to specific sections on transport, storage, treatment, or disposal.	Applicable to off-site transportation. RCRA applicability requires a RCRA hazardous waste (see 40 CFR 261) and action which constitutes generation, transport, treatment, storage, or disposal. If waste was disposed after effective date of RCRA, disposal triggered RCRA, otherwise RCRA will be triggered by treatment of the waste. Management of treatment residuals subject to RCRA if residents retain characteristic.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Definition and identification of hazardous waste 40 CFR 261 Identifies RCRA hazardous waste as: (1) characteristic; (2) listed; or (3) mixture of solid waste and listed hazardous waste.	No listed waste present on-site. Excavated material will be properly characterized to ensure proper management.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Standards for Generators 40CFR 262 Establishes regulation covering activities of generators of hazardous waste. Requirements include ID number, record keeping, and use of uniform national manifest.	Applicable if wastes are RCRA hazardous and go off-site.	See Alt. 2A	May be relevant and appropriate for on-site containment.	See Alt. 2A	See Alt. 2A	See Alt. 2A
Standards for Transport 40 CFR 263 The transport of hazardous waste is subject to requirements including DOT regulations, manifesting, record keeping, and discharge cleanup.	Applicable if wastes are RCRA hazardous and go off-site.	See Alt. 2A	Not applicable for on-site containment unit.	See Alt. 2A	See Alt. 2A	See Alt. 2A
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 264)						
Subpart A—General 40 CFR 264.1–264.4	Relevant and appropriate to treatment, containment and capping	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A

Table 9 (Continued)

**Development of Action-Specific ARARs
Waukegan Manufactured Gas and Coke Plant**

General requirements and application of section 264 standards	of RCRA hazardous waste.					
Subpart D—Contingency Plan and Emergency Procedures 40 CFR 264.50–264.56	Relevant and appropriate to remedy construction for RCRA hazardous waste.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subpart F—Releases from Solid Waste Management Units (SWMU) 40 CFR 264.90–264.101 Requirements for releases from SWMUs including monitoring, protection of groundwater, corrective action, and detection monitoring.	Not applicable for excavation and treatment off site.	Not applicable for excavation and disposal off site.	May be relevant and appropriate for on-site containment unit.	See Alt. 2A	See Alt. 2B	See Alt. 2B
Subpart G—closure and Postclosure 40 CFR 264.10–264.120 General closure and postclosure care requirements. Closure and postclosure plans (including operation and maintenance), site monitoring, record keeping, and site use restriction.	Relevant and appropriate if RCRA hazardous wastes are left on site.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subpart L—Waste Piles 40 CFR 264.251–264.259 Requirements for hazardous waste kept in piles. Requirements include liner, leachate collection unless under an appropriate structure.	Not an ARAR. Waste piles are not part of remedy	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subpart N—Landfills 40 CFR 264.301–264.317 Requirement for design, operation, and maintenance of a new hazardous waste landfill. Includes minimum technology requirements under HSWA (double liner leachate collection).	Not an ARAR.	See Alt. 2A	Applicable to soil if it is hazardous.	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subpart s—Corrective Action for Solid Waste Management Units 40 CFR 264.552–264.553 Requirements of corrective action management and units (CAMU) and temporary units (TUs). Designation of CAMU is made on site-specific basis by regional administrator consistent with criteria listed in regulation;	Relevant and appropriate if residuals to dispose of are hazardous.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A

Table 9 (Continued)

**Development of Action-Specific ARARs
Waukegan Manufactured Gas and Coke Plant**

requirements for CAMU are site-specific.						
Subpart X—Miscellaneous Treatment 40 CFR 264.600–264.603 Standards for performance of miscellaneous treatment units. General environmental performance standards which are protection of human health and the environment. Prevent releases to environment.	Relevant and appropriate if materials to be treated are RCRA hazardous.	See Alt. 2A	No treatment will occur.	See Alt. 2A	See Alt. 2A	See Alt. 2A
Standards for Management of Specific Hazardous Wastes and Facilities (40 CFR 266)						
Land Disposal Restrictions 40 CFR 268, Subpart C and Subpart D The land Disposal restrictions and treatment requirements for materials subject to restrictions on land disposal. Must meet waste-specific treatment standards prior to disposal in a land disposal unit.	Relevant and appropriate if residuals are hazardous, but CAMU would not trigger LDRs,	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Clean Water Act						
NPDES 40 CFR122, 125 Regulates the discharge of water into surface water bodies. The State of Illinois has authority to administer NPDES in Illinois.	Not ARAR. Treated water will be reinjected into groundwater treatment cells.	See Alt. 2A	See Alt. 2A	See Alt. 2A		Not ARAR. No direct discharge to surface water. Pretreated water will go to POTW.
Pretreatment Standards 40 CFR403 Pretreatment standards for the control of pollutants discharged to POTWs. The POTW should have either an EPA approved program or sufficient mechanism to meet the requirements of the national program in accepting CERCLA waste.	Not ARAR. Treated water will be reinjected into groundwater treatment cells.	See Alt. 2A	See Alt. 2A	See Alt. 2A		Applicable. Treated water must meet NSSD pretreatment standards.
Safe Drinking Water Act Illinois governs reinjection to groundwater. See State ARARs.						
Toxic Substances Control Act (TSCA) Not applicable. PCBs less than 50 ppm on site.						
Occupational Safety and Health Act						
29 U.S.C. 651 29 CFR 1910	Applicable. OSHA applies to all workers on the site during	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A

Table 9 (Continued)

**Development of Action-Specific ARARs
Waukegan Manufactured Gas and Coke Plant**

29 CFR 1910.126 General Industry Standards—Protection of worker health at hazardous waste operations. Requires training, protective equipment, proper handling of wastes, monitoring of employee health, and emergency procedures for workers at hazardous waste operations.	construction and operation of remedial actions.					
29 CFR 1926 Safety and health standard.	Potential ARAR. Applies to all workers.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
<i>Hazardous Materials Transportation Act</i>						
40 CFR 100-109 Transportation of hazardous materials. Specific DOT requirements for labeling, packing, shipping papers, and transport by rail, aircraft, vessel, and highway.	Applicable. Off-site shipment of waste may occur.	See Alt. 2A	Not ARAR, no shipment of waste off-site	See Alt. 2A	See Alt. 2A	See Alt. 2A
<i>State Requirements</i>						
<i>Wastewater Treatment and Disposal</i> Illinois Adm. Code Title 35 Subtitle C						
Chapter 1 Water Quality Standards Designates stream classifications, monitoring requirements, POTW Regulations, effluent and pretreatment standards, NPDES permits.	Not ARAR. Treated water will be reinjected into groundwater treatment cells.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	Applicable. Treated water must meet NSSD pretreatment standards.
<i>Waste Disposal</i> Illinois Adm. Code 35 Subtitle G Chapter 1						
Subchapter c, Parts 720-729 Hazardous waste operating requirements. Standards for waste management, generators, transporters, owners, and operators of treatment, storage and disposal facilities.	Relevant and appropriate to management of hazardous waste.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter c, Part 721 Identification and listing of hazardous waste.	Relevant and appropriate to management of hazardous waste on-site.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter c, Part 722	Relevant and appropriate to	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A

Table 9 (Continued)

**Development of Action-Specific ARARs
Waukegan Manufactured Gas and Coke Plant**

Standards applicable for generators of hazardous waste.	management of hazardous waste on-site					
Subchapter c, Part 724 Subpart F—Releases from Solid Waste Management Units. Requirements for wastes contained in solid waste management units.	Relevant and appropriate if hazardous waste is left on site.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	Closure requirements not necessary if remedy meets ARARs.
Subchapter c, Part 724 Subpart G—Closure and Postclosure General closure and postclosure care requirements. Closure and postclosure plans (including operation and maintenance), site monitoring, record keeping, and site use restriction.	Relevant and appropriate if hazardous waste is left on site.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	Closure requirements not necessary if remedy meets ARARs.
Subchapter c, Part 724 Subpart I—Use and Management of Containers Standards applicable for owners and operators of hazardous waste facilities that store containers of hazardous waste.	Not an ARAR. Remedy will not employ containers.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter c, Part 724 Subpart J—Tank Systems Standards applicable for owners and operators that use tank systems for storing or treating hazardous waste.	Relevant and appropriate. Tank systems will be used to store hazardous waste, if influent exceeds TCLP limits.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter c, Part 724 Subpart K—Surface Impoundments Standards applicable for owners and operators that use surface impoundments to treat, store or dispose of hazardous waste.	Not an ARAR. Surface impoundment not used in remedy.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter c, Part 724 Subpart L—Waste Piles Requirements for hazardous waste kept in piles. Requirements include liner, leachate collection unless in a container or structure.	Not an ARAR. Waste piles not used in remedy.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter c, Part 724 Subpart M—Land Treatment Standards applicable for owners and operators of facilities that treat or dispose of hazardous waste	Not an ARAR. Land treatment not used in remedy.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A

Table 9 (Continued)

**Development of Action-Specific ARARs
Waukegan Manufactured Gas and Coke Plant**

in land treatment units.						
Subchapter c, Part 724 Subpart N—Landfills Regulations for owners and operators of facilities that dispose of hazardous waste in landfills. Requirements for design, operation, and maintenance of hazardous waste landfills.	Not an ARAR. Landfill not a part of remedy.	See Alt. 2A	Relevant and appropriate for disposal of hazardous waste material in on-site containment unit.	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter c, Part 724 Subpart O—Incinerators Standards applicable for owners and operators of hazardous waste incinerators.	Not an ARAR. No on-site incineration to take place.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter c, Part 724 Subpart X—Miscellaneous Units Standards applicable for owners and operators that treat, store or dispose of hazardous waste in miscellaneous units.	Relevant and appropriate if materials to be treated are RCRA hazardous.	See Alt. 2A	No treatment will occur.	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter c, Part 728 Identifies land disposal restrictions and treatment requirements for materials subject to restrictions on land disposal. Must meet waste-specific treatment standards prior to disposal in a land disposal unit.	Relevant and appropriate to disposal of hazardous waste. Applicable to soils containing F034 listed hazardous waste (i.e, contamination from creosote).	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter d, Part 730 Underground injection control and underground storage tank programs.	Potential ARAR for reinjection of treated water in treatment cells.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	Not applicable.
Subchapter f Site remediation program. Development of risk-based remediation objectives.	May be relevant and appropriate for waste excavated. Risk based cleanup goals are developed in Chapter 3.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	Not applicable.
Subchapter g Requires chief operator of certain waste disposal sites (solid and hazardous waste) to obtain prior conduct certification.	CERCLA site is exempt from permitting. Chief operator of waste disposal site would be required to comply with substantive requirements. Requirement may be relevant and appropriate to capping	See Alt. 2A	May be relevant and appropriate for on-site containment unit.	See Alt. 2A	See Alt. 2A	Not applicable. Wastewater treatment is considered treatment not disposal.

Table 9 (Continued)

**Development of Action-Specific ARARs
Waukegan Manufactured Gas and Coke Plant**

Subchapter h Illinois "Superfund" program.	Not applicable. The Illinois Hazardous Substances Pollution Contingency Plan is applicable to State response taken at sites which are not the subject of a federal response taken pursuant to CERCLA.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Subchapter I, Parts 807-810 Solid Waste and Special Waste Hauling	May be applicable to solid waste/special waste, possibly including wastewater sludge, stored on-site prior to off-site disposal.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Part 811 Applies to all new landfills	Not an ARAR.	See Alt. 2A	Applicable for on-site containment unit.	See Alt. 2A	See Alt. 2A	See Alt. 2A
<ul style="list-style-type: none"> Subpart A—General Standards for All Landfills Location standards, operating standards, closure and post-closure maintenance. 	Not an ARAR.	See Alt. 2A	The site is not located within the 100-year floodplain. Potential ARAR for on site containment unit.	See Alt. 2A	See Alt. 2A	See Alt. 2A
<ul style="list-style-type: none"> Subpart C—Putrescible and Chemical Waste Landfills General Location standards, liner and leachate collection system requirements, final cover requirements. 	Not an ARAR.	See Alt. 2A	Applicable for on-site containment unit.	See Alt. 2A	See Alt. 2A	See Alt. 2A
<ul style="list-style-type: none"> Subpart C—Putrescible and Chemical Waste Landfills Facility Location (811.302) Location of landfill including setback zone, proximity to sole source aquifer, residences, schools, hospitals or runaways. 	Not an ARAR.	See Alt. 2A	Barriers may need to be placed to block view of containment unit.	See Alt. 2A	See Alt. 2A	See Alt. 2A
Air Pollution Illinois Adm. Code Title 35 Subtitle B						
Part 201, Permits and General Provisions. 201.142 Construction Permit Required	Not an ARAR. A CERCLA site is exempt from permitting.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Part 212, Subpart K (fugitive Particulate Matter). Site construction and processing activities would be subject to Sections 212.304 to .310 and .312	Potential ARAR. Remedial action may generate fugitive dust. Rules require dust control for storage	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A

Table 9 (Continued)

**Development of Action-Specific ARARs
Waukegan Manufactured Gas and Coke Plant**

which relate to dust control.	piles, conveyors, on-site traffic, and processing equipment. An operating program (plan) is required and is to be designed for significant reduction of fugitive emissions.					
Part 218, Organic Material Emission Standards and Limitations for the Chicago Area (includes Lake County); Subpart C: Miscellaneous Equipment; 218.141 Separation Operations	Not an ARAR. On-site wastewater treatment does not process water containing free phase organic material.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Part 218, Organic Material Emission Standards and Limitations for the Chicago Area (includes Lake County); Subpart K: Use of Organic Material; 218.301-.303	Not an ARAR. The discharge of greater than 8 lbs/hr of VOC from any aspect of the remedial action is not likely.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Part 228 Asbestos May apply if asbestos containing material is encountered.	Not an ARAR. Excavation of soil is not expected to uncover asbestos containing material.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Part 245 Odors May apply if pollutants have strong odors that are determined to be nuisance.	Potential ARAR. Excavation of soil and wastewater treatment processes may create odors.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A
Part 900 Noise: General Provisions; may apply if sustained noise intensity exceeds nuisance levels.	Potential ARAR. Excavation and processing will generate noise. Treatment equipment (blowers, etc) may generate noise.	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A	See Alt. 2A

APPENDIX A

**ADMINISTRATIVE RECORD INDEX
AND
LOCATIONS OF REPOSITORIES:**

**U.S. EPA Docket Room for Region V
Chicago, Illinois**

**Waukegan Public Library
128 North County Street
Waukegan, Illinois**

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
WAUKEGAN HARBOR COKE PLANT SITE
WAUKEGAN, ILLINOIS

JUNE 6, 1990

<u>NO.</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
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2	02/09/90	Bentley, L., General Motors Corp.	Justus, N., U.S. EPA	Letters re: General Motors response to U.S. EPA's 104(e) request for information pertaining to Outboard Marine Corp.	407
3	03/06/90	Karr, G., Rooks, Pitts & Poust	Field, R., U.S. EPA	Letters re: U.S. EPA 104(e) Request; OMC Site, with the original Affidavit for William Turk, Comptroller for Elgin Joliet & Eastern Railway Co., deeds, licenses, leases, easements and maps attached	447
4	04/02/90	Keller, D., Bell, Boyd & Lloyd	Justus, N., U.S. EPA	Letters re: North Shore Gas Co.'s response to the U.S. EPA's Request for Information pursuant to Section 104(e) of the CERCLA and Section 3007 of the RCRA, regarding the Outboard Marine Corp. Site in Waukegan, IL	574

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FEBRUARY 10, 1992

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2	08/16/91	Brissette, K., Canonie Environmental	Nolan, C., U.S. EPA	Cover Letter/Report on Soil & Water Data from the New Slip Area	146

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11	01/17/92	Watson, J., Gardner, Carton & Douglas	Selman, R., Bell, Boyd & Lloyd	Correspondence/Unsigned Revised Draft of License Agreement	11
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13	01/29/92	Selman, S., Bell, Boyd	Kissel, R., Gardner Carton & Douglas	Correspondence regarding the Waukegan Coke Plant Site Licence Agreement	3

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**U.S. EPA ADMINISTRATIVE RECORD
WAUKEGAN HARBOR COKE PLANT SITE
WAUKEGAN, ILLINOIS
UPDATE #2
08/24/93**

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8	06/13/91	Nolan, C., U.S. EPA	Relf, H. and Langseth, J., Barr Engineering Company	Memo re: Response to Items Discussed at 5/30/91 Meeting and Conference Call on 6/6/91	2
9	06/18/91	Relf, M., Barr Engineering Co.	Nolan, C., U.S. EPA	Letter Re: Schedule for Submittal of Work Plan and Associated Documents	1
10	7/01/91	Barr Engineering Company	U.S. EPA	Technical Memorandum for Proposed Modeling for RI/FS	26
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12	07/12/91	Barr Engineering Company	North Shore Gas Company	Technical Memorandum for Treatability Studies	28
13	07/12/91	Langseth, J., Barr Engineering Company	Nolan, C., U.S. EPA	Transmittal Letter for the QAPP, Technical Memorandum on Treatability Studies, and the Draft Technical Memorandum on PRGs/ARARs	1

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14	08/23/91	Schupp, G., U.S. EPA	Mayka, J., U.S. EPA	Quality Assurance Section's Review of the First Revision GAPP	9
15	09/12/91	Moyer, S., IEPA	Nolan, C., U.S. EPA	Letter Naming Tracy Fitzgerald as the New IEPA Project Coordinator	1
16	09/20/91	Nolan, C., U.S. EPA	Boyle, P., Peoples Gas Light and Coke Company	Final Comments on the Work Plan (with Handwritten Comments)	4
17	09/24/91	Schupp, G., U.S. EPA	Mayka, J., U.S. EPA	Quality Assurance Section's Review of Initial Draft GAPP for Oversight Activities	6
18	10/11/91	Payne, D., U.S. EPA	Mayka, J., U.S. EPA	Laboratory Evaluation of CM2M-Mill	8
19	10/24/91	Barr Engineering Company	U.S. EPA	RI/FS, Final Work Plan	204
20	11/15/91	Nolan, C., U.S. EPA	Boyle, P., Peoples Gas Light and Coke Company	Letter re: Approval of the Work Plan	2
21	11/21/91	Jones, V., U.S. EPA	Bikinis, J., U.S. EPA	Approval of the First Revision GAPP for Oversight Activities, with Comments	14
22	01/09/92	Nolan, C., U.S. EPA	Boyle, P., Peoples Gas Light and Coke Co.	Letter re: GAPP and Phase I Modifications Approval	1
23	07/16/92	Nolan, C., U.S. EPA	Boyle, P., North Shore Gas Co./Peoples Gas	U.S. EPA's Comments on the Draft Technical Memorandum for Preliminary Remediation Goals (PRGs) and ARARs	3
24	08/00/92	Barr Engineering Company	U.S. EPA	RI/FS, Phase I Technical Memorandum (Appendix B)	1617
25	09/04/92	Elly, C., CRL, U.S. EPA	PRC	Analysis of Sample Data Package for Case # 10320	49
26	09/04/92	Barr Engineering Company	North Shore Gas Company	Revised Technical Memorandum for Preliminary Remediation Goals (PRGs) and Applicable or Relevant and Appropriate Requirements (ARARs)	46
27	10/20/92	Hersmann, R., PRC	Bolen, W., U.S. EPA	Summary Memorandum: Oversight of Phase I Remedial Investigation Activities (March 1992-April 1992)	95

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29	01/11/93	Bolen, W., U.S. EPA	Langseth, J., Barr Engineering Company	U.S. EPA's Comments on the Phase I Ground Water Modeling as Outlined in the "Proposed Modeling for RI/FS Technical Memorandum" and the "Phase I RI/FS Technical Memorandum" (Includes Handwritten Comments)	5
30	02/03/93	Bolen, W., U.S. EPA	Langseth, J., Barr Engineering Company	U.S. EPA and IEPA's Comments to the Phase I Technical Memorandum	7
31	02/18/93	Bolen, W., U.S. EPA	Langseth, J., Barr Engineering Company	IEPA's Response to the Revised Technical Memorandum for PNGs and ARARs	5
32	02/23/93	Langseth, J., Barr Engineering Company	Bolen, W., U.S. EPA	Letter re: Receipt of U.S. EPA Comments on the Phase I Technical Memorandum and the Proposed Modeling	2
33	03/15/93	Langseth, J., Barr Engineering Company	Bolen, W., U.S. EPA	Letter Summarizing the Agreements Reached at the March 3, 1993 Meeting of Representatives and Consultants to North Shore Gas, U.S. EPA and the IEPA	8
34	04/08/93	Barr Engineering Company	U.S. EPA	RI/FS, Phase I Technical Memorandum (Appendices A-C, E-W)	414
35	04/02/93	Bolen, W., U.S. EPA	Langseth, J., Barr Engineering Company	Letter re: Request for Justification Concerning Sampling of the Sand and Waste Pile	1
36	05/21/93	Bolen, W., U.S. EPA	Langseth, J., Barr Engineering Company	U.S. EPA and IEPA's Comments on the RI/FS Phase I Technical Memorandum	10
37	06/08/93	Fitzgerald, T.E., IEPA	Bolen, W., U.S. EPA	Letter re: IEPA's Position Regarding the Discharge of Pollution Control Water Onsite	2
38	06/16/93	Langseth, J., Barr Engineering Company	Bolen, W., U.S. EPA	Letter re: Conclusions Reached During the June 7, 1993 Conference Call re: the IEPA Comment Letter on the RI/FS Phase I Technical Memorandum	4
39	06/30/93	Langseth, J., Barr Engineering Company	Bolen, W., U.S. EPA	Barr's Response to Comments on the April 1993 RI/FS, Phase I Technical Memorandum	205
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41	07/13/93	Willman, G., IEPA	Bolen, W., U.S. EPA	Letter re: IEPA's Concurrence on Barr's Response to Agency Comments on the April 1993 Phase I Technical Memorandum	1

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42	07/14/93	Fitzgerald, T.E., IEPA	Balen, W., U.S. EPA	IEPA's Written Approval of the Phase II Work Plan	1
43	07/14/93	Balen, W., U.S. EPA	Langseth, J., Barr Engineering Company	Letter re: Approval of the Phase II Work Plan, with Listed Exceptions	1
44	07/15/93	Langseth, J., Barr Engineering Company	Lonzi, G., GNC	Letter re: Raised Questions Concerning the Storage of PCB-Containing Materials	2
45	07/28/93	Balen, W., U.S. EPA	Recipients	Memo Indicating That the Phase I Technical Memorandum Should Be Considered Final	1

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ADMINISTRATIVE RECORD
FOR
WAUKEGAN MANUFACTURED GAS AND COKE PLANT SITE
WAUKEGAN, ILLINOIS

UPDATE #3
FEBRUARY 19, 1999

<u>NO.</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
1	06/11/93	Traweek, L. , American Gas Association	Recipients	Memorandum re: Edison Electric Institute's Manufactured Gas Plant Remediation Strategy w/ Attachments	13
2	02/00/95	Barr Engineering Company	U.S. EPA	<i>Remedial Investigation Report for the Waukegan Manufactured Gas and Coke Plant Site</i>	1115
3	1997-1999	Langseth, J. , Barr Engineering Company	Bellot, M. , U.S. EPA	<i>Monthly Progress Reports for the Periods October- December 1997; January , March, May and July 1998; September-December 1998; and January 1999 for the Waukegan Manufactured Gas and Coke Plant Site</i>	41
4	12/09/97	VanDuyn, S. , Barr Engineering Company	Bellot, M. , U.S. EPA	Letter Transmitting Tabulated Data from the September 1997 Beach Transect and Lake Sampling at the Waukegan Manufac- tured Gas and Coke Plant Site	29
5	1998	U.S. EPA	File	<i>Work Plan: 1998 Waukegan Harbor and Lake Michigan Surface Water Sampling for the Waukegan Manufactured Gas and Coke Plant Site</i>	24
6	04/29/98	Brown, R. , et al; Fluor Daniel GTI	North Shore Gas Company/ General Motors Corporation	<i>Treatability Study to Evaluate Aerobic Bio- remediation of Contam- inated site Groundwater at the Waukegan Manufac- tured Gas and Coke Plant Site</i>	184
7	05/14/98	Fletcher, J. , University of Oklahoma	U.S. EPA	Report: <i>Implementation of Phytoremediation at the Waukegan Manufactured Gas and Coke Plant Site</i>	31

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9	06/30/98	Langseth, J. , Barr Engineering Company	Bellot, M. , U.S. EPA	Letter Transmitting Two Sets of Field Sampling Reports for Sampling Completed During 1997- 1998 for the Waukegan Manufactured Gas and Coke Plant Site	152
10	08/00/98	U.S. EPA/ OSWER	E.P.A.	Technology Fact Sheet: A Citizen's Guide to Phytoremediation (EPA 542-F-98-011)	6
11	08/27/98	Langseth, J. , Barr Engineering Company	Bellot, M. , U.S. EPA	Letter re: Results of the June 30 - July 2, 1998 Surface Water Sampling Near the Wau- kegan Manufactured Gas and Coke Plant Site	29
12	11/06/98	Barr Engineering Company	U.S. EPA	Feasibility Study for the Waukegan Manufactured Gas and Coke Plant Site	789
13	11/13/98	Larsen, J. , Larsen Marine Service	Bellot, M. , U.S. EPA	Letter re: U.S. EPA's Remediation Plan for the Waukegan Manufactured Gas and Coke Plant Site	1
14	11/20/98	Langseth, J. , Barr Engineering Company	Bellot, M. , U.S. EPA	Letter re: Results of the September 15-18, 1998 Surface Water Sampling Near the Waukegan Manufactured Gas and Coke Plant Site	29
15	02/00/99	U.S. EPA		Letter re: U.S. EPA's Approval of the Feas- ibility Study Report for the Waukegan Manu- factured Gas and Coke Plant Site (PENDING)	
16	02/00/99	U.S. EPA		Fact Sheet: Proposed Plan for the Outboard Marine Company/Waukegan Coke Plant Superfund Site	10

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17	02/19/99	U.S.	EPA	<i>Proposed Plan</i> for the Outboard Marine Company/ Waukegan Coke Plant Site	22

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UPDATE #4
JUNE 7, 1999

<u>NO .</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
1	03/04/99	Graham, W. , Glen Ellyn, IL Resident	Pope, J. , U.S. EPA/ OPA	FAX Transmission re: Comments on the Proposed Plan for the OMC/Waukegan Coke Plant Site w/ Attachment	9
2	04/19/99	Beck, J. , U.S. EPA	Bellot, M. , et al. ; U.S. EPA	E-Mail Transmission re: Comments on the Proposed Plan for the OMC/Waukegan Coke Plant Site	1
3	04/23/99	Elgin Joliet and Eastern Railway Company	Pope, J. , U.S. EPA/ OPA	Letter re: EJ&E's Comments on the Proposed Plan for the OMC/Waukegan Coke Plant Site	8
4	04/23/99	Crawford, J. , Outboard Marine Corporation	Pope, J. , U.S. EPA	Letter re: OMC's Comments on the Proposed Plan and Feasibility Study for the OMC/Waukegan Coke Plant Superfund Site	269
5	05/20/99	Andrae, W. , CH2M Hill	Tennenbaum, S. , U.S. EPA	Cover Letter Forwarding Public Comments Received for the Waukegan Manu- factured Gas and Coke Plant Site (SEE DOCUMENTS #1-4)	1

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FOR
WAUKEGAN MANUFACTURED GAS AND COKE PLANT SITE
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UPDATE #5
SEPTEMBER 28, 1999

<u>NO .</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
1	05/00/92	U.S. EPA/ OSWER	U.S. EPA	Superfund Accelerated Cleanup Bulletin: <i>Pre- sumptive Remedies for Wood Treatment Facilities</i> (Publication 9203.1-021)	3
2	04/00/93	U.S. EPA/ OSWER	U.S. EPA	Quick Reference Fact Sheet: Presumptive Remedies: <i>Technology Selection Guide for Wood Treater Sites</i> (Publication 9360.0-46FS; EPA 540-F- 93-020)	8
3	04/26/93	U.S. EPA/ OSWER	U.S. EPA	Memorandum: Remediation of Historic Manufactured Gas Plant Sites	3
4	12/00/95	U.S. EPA/ OSWER	U.S. EPA	Guidance: <i>Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites</i> (OSWER Directive: 9200.5- 162; EPA/540/R-95/128; PB 95-963410)	61
5	08/04/97	U.S. EPA	U.S. EPA	Feasibility Study/Record of Decision Analysis for Wood Treater Sites with Contaminated Soils, Sedi- ments, and Sludges	75
6	01/26/99	Cotsworth, E. , U.S. EPA/ OSWER	Hammond, S. , New York State Department of Environmental Conservation	Letter re: Processes Used to Decharacterize Coal Tar Wastes at Manufactured Gas Plant (MGP) Sites in New York State w/Attachment	6
7	03/03/99	L&L Reporting	U.S. EPA	Transcript of March 3, 1999 Public Meeting re: the Outboard Marine/ Waukegan Coke Plant Site	66
8	03/05/99	Skinner, T., Illinois EPA	Muno, W. , U.S. EPA	Letter re: Illinois EPA's Concurrence on the Proposed Plan for the Waukegan Manufactured Gas and Coke Plant Site	1

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9	06/00/99	Barr Engineering Company	U.S. EPA	Feasibility Study Addendum for the Waukegan Manufactured Gas and Coke Plant Site	24
10	00/00/00	U.S. EPA	Public	Record of Decision for Waukegan Manufactured Gas and Coke Plant Site (PENDING)	

APPENDIX B

**RESPONSIVENESS SUMMARY
RECORD OF DECISION**

**OUTBOARD MARINE COMPANY/WAUKEGAN COKE PLANT
SUPERFUND SITE**

WAUKEGAN, ILLINOIS

September, 1999

RESPONSIVENESS SUMMARY

OUTBOARD MARINE COMPANY/WAUKEGAN COKE PLANT SUPERFUND SITE WAUKEGAN, ILLINOIS

1.1 Introduction

This responsiveness summary presents responses to comments provided by the public on the proposed plan for the Waukegan Manufactured Gas and Coke Plant Site (WCP Site) in the City of Waukegan, Illinois. Comments were received from the following parties:

Judy Beck
William K. Graham
Elgin Joliet and Eastern Railway Company
Outboard Marine Corporation

Comments will be repeated verbatim and in italic where the comment is short and direct. Where comments are lengthy they are summarized. The complete text of comments is available in the Administrative Record located in the Waukegan Public Library, 128 North County Street, Waukegan, Illinois and U.S. EPA Region 5 Records Center, 77 West Jackson Blvd., Chicago, IL 60604. Following the comment, U.S. EPA's response is presented. Comments are organized by each commentator.

1.2 Judy Beck

1. The fish advisory in the Proposed Plan Fact Sheet could be misleading to the public because fish are contaminated with PCBs in addition to arsenic. I am assuming that the arsenic is "in addition to".

The proposed plan summary of human and ecological risks (PP, pg. 3) states that there is a risk to human health from eating fish from the lake or the harbor because they may contain small amounts of arsenic. The commentator is correct in assuming that any risk from PCBs is in addition to the risk from arsenic that is a result of the WCP site.

2. What amounts of contamination would be released to the lake in alternative #3

The release of contaminants to the lake will be reduced by at least 40 to 80% from the existing amounts (FS, pg. 5-8). The mass discharge of contaminants to the Longshore Current Zone of Lake Michigan under Alternative 3 is conservatively estimated at 31 kg/day ammonia, 5.9 kg/day phenols and 0.3 kg/day arsenic (FS, Table 5-D-6).

3. *What limits are in place for surface water in the harbor?*

Harbor surface water quality criteria are ammonia - 15 mg/l, arsenic - 0.148 mg/l and phenols 0.1 mg/l.

1.3 **William K. Graham**

1. The commentor requests that U.S. EPA apply a decision tool similar to that provided in the attached paper which proposes quantitation of risk for occupational fatalities. Based on this methodology the commentator states that there is a probability of at least one in ten of a fatality in connection with construction of the proposed remedy. In addition nonfatal injuries for construction activities at a remediation site would add to site construction risks. The commentor states that these facts can be used to demonstrate to the public that the proposed remedy is not technically feasible and that it is U.S. EPA's legal obligation to fairly communicate risks to the public.

U.S. EPA Response: U.S. EPA has used similar methods of estimating construction-related risks from site remediation at sites where large scale excavation or capping is proposed. The risk of death and injuries as well as traffic related deaths and injuries were estimated for the Onalaska Superfund site (Onalaska Municipal Landfill Superfund Site, Onalaska, Wisconsin, Feasibility Study, 1994). The excavation and cover for the proposed remedy for the WCP site is not of such a large scale as the Onalaska site or the example site used in the referenced paper. The excavation volume of the WCP proposed remedy is only 5% of the example site excavation volume (26,600 cys, at most, compared to the example site excavation volume of 484,000 cys.). Likewise the proposed remedy cover involves placement of only 12 % of the soil necessary for the example site cap (17,200 cys for the phytoremediation cap versus 145,000 cys for the example site RCRA cap). Prorating the paper's estimated risks downward for the much smaller quantities of the proposed remedy results in a risk of 0.008 (1 in 125) for a fatality from excavation and 0.0014 (1 in 714) for a fatality from construction of the phytoremediation cap.

U.S. EPA recognizes that construction risks should be considered and includes that evaluation under the Short-term Effectiveness- Protection of Remedial Workers and Protection of Community evaluation criteria. U.S. EPA however has used its judgement in not requiring detailed calculations of construction-related risks be performed for the WCP site because of the relatively small volumes of soil to be remediated and the relatively small volume of soil for the phytoremediation cap. In summary, the expected construction-related risks are not sufficient to require detailed calculations and are not sufficient to rate the alternative as technically infeasible.

2. *The site environs may qualify under US. EPA guidelines under the Environmental Justice policy. It would be wholly inappropriate to take expeditious shortcuts in the decision process which clearly put at risk the members of this community.*

U.S. EPA's response to Mr. Graham's first question showed that because the quantities of excavated soil are considerably less than those presented in the referenced paper, the WCP site risks would also be much less than those presented by the paper and quoted by the commentor. Prorating the estimated risks for off-site traffic related accidents downward for the much smaller excavation volume of the proposed remedy results in a risk of 0.0028 (1 in 364) for an off-site traffic related fatality (compared to the 1 in 20 risk stated by the commentor). As discussed above, U.S. EPA considered the risk to the community under the Short-term Effectiveness-Protection of Community evaluation criteria during the evaluation of the remedial alternatives. U.S. EPA believes the proposed alternative offers the best balance of all the evaluation criteria, and this evaluation is not dependent on whether the community is designated as an Environmental Justice community.

1.4 Elgin Joliet and Eastern Railway Company

1. EJ&E protests that counsel for U.S. EPA informed it that it would not receive special notice for remedial investigation of the Waukegan Coke plant site, but that U.S. EPA's Project Manager for Remediation informed it that it would receive special notice for remediation of the site. EJ&E further protests that there is no basis for naming it as a potentially responsible party for the site.

U.S. EPA Response: EJ&E owned the site from 1893 to 1927. During part of this time, ChicagoTie and Timber Company operated a creosote wood-treating plant on the property, which is the source of the current creosote-contaminated soils on the site. As such, EJ&E is liable as an owner under Section 107 of CERCLA. The fact that EJ&E did not receive special notice for the remedial investigation in no way precludes it from receiving special notice for remediation of the site. If and when U.S. EPA provides special notices to the PRPs for the Waukegan Coke Plant site, the U.S. EPA will follow the special notice procedures in Section 122(e) of CERCLA.

2. *The CT&T wood-treating operations were not consequential contributors to the reported groundwater contamination.*

While the aqueous discharges from the manufactured gas and coke operations are believed to be a major source of the ground water contamination, U.S. EPA disagrees that other sources such as natural flushing of soil contamination from the wood treatment operations are insignificant contributors to ground water contamination.

3. *The CT&T wood-treating facility operations are not associated with the PAH and arsenic contaminated soils proposed for excavation.*

U.S. EPA does not dispute this assertion except that the PAH contaminated soil located 100 feet southeast of Slip Number 4 (the area surrounding borings SB-26 and SB-27) may be associated with creosote wood treating operations. This is because the Lake Michigan beach line position

may have been east of this location in 1926 (see FS figure 2-3), the year EJ&E sold the site to North Shore Coke and Chemical Company. As a result this area could have been used for creosote treated wood storage or disposal of creosote sludge.

4. There is no evidence in the record that the contaminated soil removed from Slip Number 4 was contaminated with creosote rather than coal tar.

The CT&T wood treating plant buildings and tanks were located immediately adjacent to the soil excavated from Slip Number 4 (see RI figure 3.1-1). The soil contaminants in the creosote soil area are similar to those expected from creosote. These two facts make it most likely that the soil designated as “creosote soil” presently in the designated soil storage area is contaminated from CT&T operations. See response to comment 3 above relative to the PAH contaminated soil southeast of the slip.

5. The risk assessment results presented in the Proposed Plan do not support the conclusion that the contamination presents a health hazard that requires active remediation.

The risk assessment results are presented in the Final Technical Memorandum Waukegan Manufactured Gas and Coke Plant Site Human Health Risk Assessment, November 14, 1995. The estimated risks for the exposure pathways evaluated are presented in Table 3 of this ROD. For the occupational and utility worker scenarios considered to be the reasonable future uses of the site, cancer and/or non-cancer risks exceeded the allowable risk of 1×10^{-4} and HI of one. The contaminants most often contributing to the risk are PAHs and arsenic. This supports U.S. EPA’s conclusion that health hazards require remediation at the WCP site. In addition, groundwater standards, and potentially surface water standards, are being exceeded as a result of contamination at the WCP site.

6. The Remedial Action Objectives are overly cautious or are addressed by alternatives that are overly aggressive, based on site risks. Remedial Action Objectives that allow the use of a “Limited Action” alternative that includes institutional controls should be seriously considered

The remedial action objectives for soil included protection of human health from soil with concentrations of contaminants representing an excess cancer risk of 1×10^{-6} as a point of departure. The proposed remedy includes excavation of PAH and arsenic contaminated soil that 1×10^{-5} exceeds excess cancer risk using the representative high exposure (RHE) utility worker exposure. The more conservative 1×10^{-6} risk level, the more conservative reasonable maximum exposure (RME) assumptions and the more conservative residential land use exposure assumptions were not used in defining the areas for more costly remediation. U.S. EPA believes the exposure levels and exposure assumptions used in identifying the areas for active remediation are reasonable given the potential for future site use.

A “Limited Action” alternative that includes institutional controls would be only marginally

more protective than the “No Action” alternative considered. A “Limited Action” alternative would not allow future site development, would not address continued contaminant flushing to the groundwater, would not address continued contaminant discharge to the lake and harbor and would not meet the groundwater objective of minimizing migration and reducing the area of impact as required by the U.S. EPA technical impracticability guidance (see FS pg. 3-12).

1.5 Outboard Marine Corporation

OMC provided comments in: 1) a cover letter dated April 23, 1999, 2) un-numbered text in an attachment to the cover letter, and 3) in numbered comments included in the attachment under the heading “Additional Comments.” Responses are organized according to each format.

1.5.1 OMC Comments in Letter Dated April 23, 1999

1. OMC April 23, 1999 Letter, pg. 1, par. 1. The commentor questions U.S. EPA’s ability to designate the site as an operable unit of the adjacent NPL Waukegan Harbor Superfund site, without meeting the statutory and regulatory requirements for listing an NPL site.

U.S. EPA Response: The National Contingency Plan (NCP) defines operable unit as “a discrete action that comprises an incremental step toward comprehensively addressing site problems....Operable units may address geographical portions of a site, specific site problems, or initial phases of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site.” 40 C.F.R. § 300.5. The NCP states U.S. EPA’s support of the operable unit concept as an efficient method of achieving safer and cleaner sites more quickly while striving to implement total site cleanups. 55 Fed. Reg. 8705 (March 8, 1990).

PCB contamination was discovered at the Waukegan Harbor Superfund site in 1975, and on September 8, 1983, the site was placed on the National Priorities List (NPL) (48 Fed. Reg. 40658.) As part of the remediation for that site, additional contamination was discovered on the Waukegan Coke Plant site, which is contained entirely within the Waukegan Harbor Superfund site. OMC currently owns both the Waukegan Harbor Superfund site and the Waukegan Coke Plant site. While it is true, as the commentor asserts, that the contamination at the Waukegan Coke Plant site was caused by activities different from those that gave rise to the PCB contamination at the Waukegan Harbor Superfund site, this fact does not preclude an operable unit designation. A site’s boundaries are the extent of the contamination. The Waukegan Coke Plant site addresses specific contamination that requires remediation as a necessary step to the remediation of the entire Waukegan Harbor Superfund site, and its operable unit designation is therefore in accordance with the NCP.

2. OMC April 23, 1999 Letter, pg. 1, par. 2. The commentor states that the contamination at the site arises from and is associated with a wood-treating plant, the production of manufactured gas

and the production of coke by parties owning or leasing the site prior to OMC's ownership. Further, the data indicate and the investigation and proposed plan recognize that the substantial majority of the contamination of concern that necessitates and drives the Proposed Plan was released during the manufactured gas plant operations over fifty years ago.

U.S. EPA Response: The manufactured gas plant operations were a major source of the current soil and groundwater contamination. Substantial soil and groundwater contamination that requires remediation was also contributed by the wood-treating plant and the coke plant. As an example, the creosote contaminated soil from the wood-treating plant is included for remediation in the proposed remedy.

3. OMC April 23,1999 Letter, pg. 2, par. 2. There is a significant potential to redevelop properties such as the site which has the unique advantage of being both lakefront and on the harbor.

U.S. EPA Response: U.S. EPA agrees with the commentor that this site has unique geographical advantages. To maximize these advantages, U.S. EPA has stressed remedy flexibility to accommodate future use considerations throughout the remedy selection process. U.S. EPA fully supports putting sites back into use and recognizes the importance of obtaining a broad base of input when making future use determinations. For this reason, U.S. EPA had discussions with current and past owners and operators, members of the local community (through the Waukegan Community Advisory Group), local business owners, the State and members of local government to solicit input on reasonable anticipated future use at this site.

4. OMC April 23,1999 Letter, pg. 2, par. 3. The commentor strongly believes that the proposed plan does not sufficiently evaluate the historic operations, and consequently, does not adequately characterize the nature, extent and impact of the historic contamination. Without further investigation and evaluation of additional information, appropriate response options cannot be identified or selected.

U.S. EPA Response: Substantial effort has been undertaken to acquire site history information and investigate the site. The remedial site investigation was conducted in 2 phases beginning in February 1992 and continuing through 1996. Additional site investigation and treatability testing has been conducted throughout the FS. U.S. EPA reviewed the additional historical information provided by the commentor and has found that it does not change the major components of the proposed remedy. Some additional investigation may, however, be warranted. Because U.S. EPA does not want to further delay remedial action at this site, any additional site investigations that are found to be needed will be added to the already identified preliminary Design Investigations. The results of additional investigations will be summarized in the Preliminary Design Report.

5. OMC April 23,1999 Letter, pg. 3, par. 1. The commentor contends that finalizing the

Proposed Plan at this time is inappropriate because there is need to further investigate and evaluate technical and land use issues.

U.S. EPA Response: See response to comment 4 above relative to the need to further investigate the site. With regard to land use issues, considerable effort was expended in evaluating the future land use of the site. As stated in comment 4, input was solicited from current and past owners and operators, members of the local community (through the Waukegan Community Advisory Group), local business owners, members of local government and Illinois EPA. Although a residential scenario was evaluated in the Baseline Risk Assessment, based on discussions regarding future land use and numerous other physical factors, the reasonable anticipated future use has been identified as industrial. Some of the physical factors that were considered in making future use determinations include: 1) the fact that site has been located in an industrial corridor for the past 100 years and there are no current plans in process to change that designation, 2) there are current industrial/commercial operations both directly north and south of the site, 3) there are ongoing discussions of expansion by adjacent businesses onto portions the site, 4) the proximity of three PCB containment cells that will be required to be managed in perpetuity, and 5) the long-term ground water cleanup requirements. The FS Appendix 3A has a discussion of Future Land Use Considerations.

6. OMC April 23,1999 Letter, pg. 3, par. 2. The commentor requests that:

a) *Further site investigations be undertaken and that the RI be supplemented and amended* See response to comment 4.

b) *The FS be revised and amended to consider the new site investigation information as well as the information presented herein.* Any new site investigation data collected will be performed as part of Preliminary Design Investigations and documented in the Preliminary Design Report.

c) *The City of Waukegan, the citizens advisory groups and OMC be consulted with respect to any impacts from the proposed plan or any additions or revisions thereto on long term site redevelopment options and revitalization plans.* U.S. EPA has conducted discussions and made presentations to representatives of the City, OMC and the Citizens Advisory Group on the remedy. U.S. EPA is committed to an ongoing dialog on mitigating concerns regarding potential impacts from remedy implementation.

d) *The comment period be extended.* The comment period was extended 30 days at the request of OMC and the Waukegan Citizen's Advisory Group. Further extension of the comment period would excessively delay implementation of the remedial action.

e) *That a revised proposed plan be submitted for public review and comment.* A revised proposed plan is not needed because substantial modifications to the proposed remedy have not been found to be warranted and any additional investigations will be conducted as part of the Preliminary Design.

1.5.2 OMC Comments in Attachment A to Letter Dated April 23,1999

1. OMC Attachment A, pg. 1, bullet 1 and pg. 2. Understanding of Historical Operations.

U.S. EPA has not obtained sufficient information on historic operations at the site, which is needed to ensure that the remedy is appropriate. In particular we believe it is especially important that additional historic operations information be obtained for each of the four distinct periods of site operations-pre-coke plant operations, coke plant operations prior to thionizer building removal, coke plant operations after thionizer building removal, and post-coke plant activities. The U.S. EPA should conduct further investigations to more fully characterize historic manufacturing activities and source areas. In particular the commentator states that the most likely source of arsenic at the site is the arsenic trioxide used in the coke plant thionizer building.

U.S. EPA believes that more information on site historic operations is not needed at this point to support making a remedy decision. The primary purpose of additional site historical information would be to better refine the current understanding of the original source concentrations and the degree of dilution that has occurred as the plume has migrated. Even if historical information were available to accurately determine initial arsenic trioxide, phenol and ammonia concentrations released to the soil or ponds, there would continue to be large uncertainties regarding the quantities discharged. As a result, the additional historic information would only marginally improve the current understanding of plume migration. Also, better understanding of plume migration is not central to determining either the need for remediation or the type of remediation. Sufficient information on the current nature and extent of contamination is available to proceed with the preliminary design of the proposed plan. The area of soil and groundwater contamination has been defined with an extensive sampling program. Additional pre-design sampling will be required, but it is not necessary to halt the remedy decision process.

The main purpose of additional historic information would be to better determine the degree of responsibility of the PRPs. Given the fact that further delays in the remediation of the site would likely result in only a marginal improvement in understanding plume migration, and the fact that better understanding plume migration is not critical to determining the need for site remediation or remedy selection, U.S. EPA sees little value in further delaying the remedial action in an attempt to collect additional site historic information.

2. OMC Attachment A, pg. 1, bullet 2 and pg. 3. Redevelopment Issues.

Although the Proposed Plan purports to facilitate the future redevelopment of the site, neither the Feasibility Study or the Proposed Plan identify or provide possible solutions to obvious soil and water quality concerns. This is a highly critical area which should be thoroughly analyzed in the Feasibility Study and become a major factor in development of the proposed remedy. Redevelopment issues which need to be addressed include possible high-density residential use,

future constructability, infrastructure maintenance and construction, and storm water Management.

Considerable effort was undertaken to evaluate potential future land use for the site, input was solicited from current and past owners and operators, members of the local community (through the Waukegan Community Advisory Group), local business owners, members of local government and Illinois EPA. Although a residential scenario was evaluated in the Baseline Risk Assessment, based on discussions regarding future land use and numerous other physical factors, the reasonable anticipated future use has been identified as industrial. Some of the physical factors that were considered in making future use determinations include: 1) the fact that site has been located in an industrial corridor for the past 100 years and there are no current plans in process to change that designation, 2) there are current industrial/commercial operations both directly north and south of the site, 3) there are ongoing discussions of expansion by adjacent businesses onto portions the site, 4) the proximity of three PCB containment cells that will be required to be managed in-perpetuity, and 5) the long-term ground water cleanup requirements. Future constructability will be more difficult in the area of solidified arsenic contaminated soil.

The excavation and off-site disposal for the arsenic soils (Alternative 3B) was considered but added greater costs and increased short term impacts from the off-site transport of the contaminated soil. The constiuction cost of on-site solidification is \$691,000 (FS Table 5-C-17) while the cost for excavation and off-site disposal is \$1,100,000 (FS Table 5-C-20). These considerations were judged to be more significant than limitations on future construction in the one-half acre area of solidified arsenic soil. A soil management plan for the proper management of soils excavated during future site activities will be developed as part of the remedial design of the proposed remedy. U.S. EPA believes the remedy decision provides enough flexibility to accommodate future use.

The disposition of groundwater and soils that are generated during maintenance of the existing utilities or the construction of new utilities or structures will be addressed in the site soils management plan to be developed as part of the remedial design. The commentor's recommendations for handling shallow contaminated groundwater via reinfiltration will be considered in the soils management plan. The creation of uncontaminated utility corridors through the site will also be considered during the soil management plan development. This concept appears, however to have limited advantages because the PAH areas of unacceptable risk to utility workers will be removed and the arsenic areas will be solidified. A utility corridor through the arsenic solidification area could be considered in the soil management plan. Storm water management under future site development will also be included in the soils management plan. Storm water will not be allowed to reinfiltrate the groundwater because an objective of the proposed remedy is to minimize infiltration.

3. OMC Attachment A, pg. 1, bullet 3 and pg. 5. Infiltration/Recharge and Soil Cap.

The soil cap proposed for the site does not appear to be appropriate. The Feasibility Study and the Proposed Plan state that the purpose for capping the site following completion of the active soil remediation is to minimize infiltration and prevent exposure to marginal zone soils. While we agree that there appears to be some merit in preventing exposure to marginal zone soils, it is not clear to OMC that infiltration should be minimized, or that the proposed cap will significantly minimize infiltration. We also did not find adequate technical support that would justify the effectiveness of the proposed phytoremediation cap in eliminating direct human exposure.

Much of the comment regarding infiltration and recharge is questioning the need to reduce infiltration. A remedial action objective for groundwater was developed in Section 2 of the FS to protect surface water quality by reducing the driving forces for groundwater migration at the site. This objective was developed in concert with an objective to reduce the contaminant mass or concentration within the plume. These objectives are necessary for the WCP site because minimizing migration and reducing the area of impact are required by U.S. EPA when attainment of MCLs is technically impracticable (see FS pg. 3-12). A remedial objective for soil was also developed to protect the environment by minimizing/eliminating the migration of contaminants in the soil to groundwater or to surrounding surface water bodies. Reducing infiltration through the site addresses both of these objectives. It reduces leaching of contaminants in the marginal zone soils that will remain on-site and it reduces the hydraulic gradient and thus the mass flux of contaminants from the site.

It is true that reducing infiltration through the cap will reduce the supply of oxygen to the groundwater (attachment A, pg. 5, bullet 1). However the mass of oxygen supplied via infiltration is estimated to be only one thirteenth of the gaseous oxygen diffusion from the vadose zone to groundwater (see FS Appendix 2G, pg. 2-G-1). As a result the reduced oxygen supply to the groundwater by reducing infiltration will be relatively insignificant at the WCP site.

The commentor makes the point that the area of greatest infiltration is the beach area and that this area is not proposed for capping (attachment A, pg. 6, bullet 1). This area is not proposed for capping because of the obvious negative aesthetic impacts this would have for the public beach. This area of groundwater contamination however is addressed through the active groundwater collection and treatment system for this area in the proposed remedy.

The commentor states that eliminating infiltration on the site results in a shift of the groundwater divide and an increase in contaminant mass flux to the harbor, which is contrary to the goal of the cap (attachment A, pg. 6, bullet 2). The remedial goal is to reduce contaminant migration to the harbor and the lake. While a shift of the groundwater divide to the east changes the direction of contaminant migration for a portion of the plume, the net effect of the reduced gradient is to reduce the annual mass flux of contaminants to the lake and harbor. Because the area around the groundwater divide is the area to be actively collected and treated, the movement of the divide eastward does not increase the mass flux of COCs to the harbor (see FSD Figures 5D-17, 5D-20 and 5D-23).

The commentor states that the small changes in hydraulic gradient between no cap alternatives and “0%” infiltration cap do not imply significant changes in contaminant flux to surface water bodies (attachment A, pg. 6, bullet 3). The small changes in gradient presented by the commentor reflect a decrease in gradient of between 13% and 31%. U.S. EPA believes these are significant decreases and that, in conjunction with the reduced leaching of contaminants to groundwater resulting from infiltration reduction, the benefit of reduced infiltration is warranted. The modeled effect of eliminating infiltration on the mass flux of COCs to surface water can be seen by comparing the mass fluxes of COCs presented in the Feasibility Study Figures 5D-15 to 5D-24. These figures present the mass fluxes for ammonia, arsenic and phenols to the lake, breakwater area and the harbor for alternatives 1, 2 and 3. For alternative 3, a 50% reduction in infiltration and a 100% reduction in infiltration assumption are presented. While large decreases in mass flux on the order of 50% are seen between alternative 1 (100% of current infiltration) and alternative 3 (0% infiltration), much of the reduction is a result of the groundwater collection and treatment system. The effect of reduced infiltration alone can be judged by comparing the alternative 3 (0% infiltration) and the alternative 3 (50% infiltration). Based on this comparison it appears that the reductions in mass flux from infiltration reduction alone are comparable to the 13 to 31 % range in the hydraulic gradients presented by the commentor. U.S. EPA considers this to be a significant reduction in mass flux.

The commentor states that the SLAEM model underestimates groundwater flow from the north because it assumes the foundations of the east end of OMC Waukegan Plant 2 acts as a barrier to groundwater flow when they are actually not significant flow barriers (attachment A, pg. 6, bullet 4). Previous information provided to the modelers indicated that these foundations were completed to the till. However, U.S. EPA does not believe the model significantly underestimates groundwater flow from the north because the simulated piezometric head and observed heads compare well at locations in proximity to OMC Waukegan Plant 2 (see FS Figure 2-B-3, 2-B-5 and 2-B-7).

The commentor states that the conceptual model does not appear to account for groundwater recharge to the peninsula that would come from the west under the OMC Waukegan Plant 2 site (attachment A, pg. 7, bullet 1). The area west of Waukegan Plant 2 was modeled and the model showed that groundwater from the area west of plant 2 would not flow onto the site (see FS Figures 2-B-1, 2-B-2, 2-B-4 and 2-B-6). Much of the recharge ends up discharging to the harbor. The simulated piezometric head and observed heads compare well at locations in proximity to OMC Waukegan Plant 2 (particularly OMC well 6 and MW-11S).

The commentor questions the need to reduce infiltration because it only provides an added safety factor for protection of surface water (attachment A, pg. 7, bullet 2). U.S. EPA believes reducing the mass flux through infiltration reduction is a necessary component to meet the overall remedial objectives including those of minimizing migration and reducing the area of groundwater impact. U.S. EPA does not believe additional modeling is necessary for the WCP site as part of the remedy selection process.

The commentor provides additional comments on the phytoremediation cap on pages 6 and 7 of Attachment A. The commentor expresses concern that 6 inches of cover soil for controlling direct contact exposure may not be sufficient. The concern is expressed that the areas proposed to be covered do not exceed direct exposure risk levels and therefore the cover may not provide remediation benefits. The commentor expresses the preference for a soil cover cap over only the remediation and marginal zone soils and suggest that 3 feet of clean soil be used. U.S. EPA believes that the 6 inches of cover soil with a vegetative cover is adequate to prevent direct contact exposure. Site maintenance will be important in assuring that areas of sparse vegetation are corrected and that adequate cover is present throughout the winter months. The marginal zone soils do exceed the 1×10^{-6} excess cancer risk level for boat workers and trespassers. In addition the entire area is to be covered to reduce infiltration and the contaminant flux to the harbor as discussed earlier.

4. OMC Attachment A, pg. 1, bullet 4 and pg. 8. Soil Remediation Areas.

The soil remediation areas do not appear to be properly defined The areas for active remediation do not appear to correlate to the analytical data, and the remediation areas do not take into account data previously provided by OMC to the U.S. EPA. In addition, the creosote impacted soils are not adequately addressed

U.S. EPA agrees that additional information and alternative development needed to be provided for the creosote soils (attachment A, pg. 8, item 1). A FS Addendum has been developed to address these issues and has been added to the Administrative Record.

The commentor expresses concern over the area of overlap of arsenic and PAH remediation (attachment A, pg. 8, item 2). The overlap area is very limited in extent (about 50 feet in diameter). Issues related to the ability to treat PAH soils with elevated arsenic will be investigated as part of remedial design. The need for further characterization of the leachability of arsenic from the arsenic remediation area soils will also be evaluated during remedial design.

The commentor states that parking lot expansion data that OMC collected was not used in determining the arsenic remediation area (attachment A, pg. 9, item 3). The maximum arsenic concentration from the OMC data from the proposed parking lot expansion presented as an attachment to the OMC comments is 102 mg/kg. This is below the 1×10^{-5} RHE for a utility worker of 940 mg/kg used as the arsenic level for solidification in the proposed remedy.

The commentor states that the arsenic remediation zone depicted on Figure 4-1 does not accurately reflect the arsenic concentrations measured at the site (attachment A, pg. 9, item 4). It appears that the commentor may have used the 1×10^{-6} RHE for a utility worker of 94 mg/kg presented on table 3-3, rather than the stated 1×10^{-5} RHE (see FS pg. 4-5, par. 3) of 940 mg/kg for identifying the arsenic remediation area.

The commentor states that the PAH remediation zone depicted on Figure 4-1 does not correlate with the 100 mg/kg isopleth line depicted on Figure 2-6 (attachment A, pg. 9, item 5). The soil concentration defining the PAH remediation area is not 100 mg/kg total PAH. As stated in the FS

Section 4 (FS pg. 4-5) the PAH remediation area is defined by the 1×10^{-5} RHE for utility workers. The soil cleanup levels range from 116 mg/kg to 1,160 mg/kg for individual carcinogenic PAHs. The area depicted on Figure 4-1 accurately depicts the soils exceeding these values.

The commentor states that additional investigations will be necessary to define the southern limit of PAH contamination on their property immediately north of Plant 1 and requests that efforts be undertaken to minimize disruptions to their operations (attachment A, pg. 9, item 6). U.S. EPA will take the comment into consideration during preliminary design investigations and remedial construction activities.

5. OMC Attachment A, pg. 2, bullet 1 and pg. 9. Extent of Groundwater Impacts and Groundwater Remediation.

The groundwater impacts are not adequately defined, particularly to the south of the site, and preferential flow pathways need to be investigated. In addition, we believe that in-situ groundwater remediation technologies were inappropriately excluded from consideration in the FS and that in-situ remediation technologies can be effectively utilized at the site. Specifically in-situ bioremediation could well be used in conjunction with biosparging to stimulate in-situ aerobic bioremediation of organic compounds. These technologies would be much less costly than the proposed groundwater remedial approach and would help to maximize the future redevelopment and use of the site.

U.S. EPA agrees that the extent of the groundwater plumes below OMC Plant 1 and further south toward the City of Waukegan Water Treatment Plant have not been fully defined (attachment A, pg. 9, item 1) and will require additional sampling during the Remedial Design. However the concentrations in this area are clearly below the concentration levels targeted for active groundwater collection and treatment. Because the need for additional investigations in the area of OMC Plant 1 will not materially impact the remedy decision, it is appropriate to evaluate this during the remedial design.

The commentor believes additional investigations north of the site need to be undertaken based on arsenic and benzene found in deep groundwater at the southeast corner of OMC Plant 2 (attachment A, pg. 10, item 2). The arsenic and benzene concentrations in the deep groundwater are similar to concentrations in MW-14 located in the beach area east of Sea Horse Drive about 300 feet east of the Plant 2 UST. However the chlorinated organics in groundwater at the UST (vinyl chloride, chloroethane, 1,1, dichloroethane, cis-1,2 dichloroethene and toluene) are not consistent with WCP site contaminants. The need for additional delineation of the northern extent of groundwater contamination will be evaluated as part of the remedial design.

The commentor believes the FS needs to provide a discussion of whether preferential flow pathways have affected migration of contaminants in the subsurface (attachment A, pg. 10, item 3). Preferential flow pathways were considered during the RI. Preferential flow paths were not found to be significant features affecting migration of groundwater contaminants. Infiltration of

contaminated groundwater to the storm sewer that drains to the harbor can be further evaluated during remedial design.

The commentor believes that in-situ remediation of groundwater technologies were inappropriately excluded from consideration in the FS (attachment A, pg. 10, par. 4). Specifically the commentor believes either in-situ bioremediation through use of ORCs or air sparging, or biosparging with vertical circulation wells, would be less costly than the proposed approach and help maximize future redevelopment of the site. These technologies were screened out because of the need for considerable dilution of the contaminants to avoid toxicity effects to the microorganisms aerobically degrading the phenol, benzene and ammonia. Specifically, ammonia degradation even with substantial dilution would be difficult to obtain at WCP site. Dilution of the high concentrations in the deep groundwater with the lower concentrations of the shallow was considered but rejected because sufficient groundwater for dilution to the necessary degree is not available in all the target areas and even with dilution, ammonia degradation may not occur. In addition to these concerns, in-situ bioremediation would not treat the arsenic contamination that is one of the main COCs discharging to the lake and harbor.

The commentor believes in-situ treatment of arsenic could be performed. U.S. EPA is unaware of any full scale system that has been installed to treat arsenic throughout a groundwater plume (attachment A, pg. 11, par.2). In-situ treatment of arsenic would involve injection of chemicals into the subsurface to precipitate the arsenic. Because of the experimental nature of in-situ arsenic treatment, considerable time and resources would need to be expended to determine whether it is a viable technology prior to proceeding with design. Because of this and the availability of feasible and cost effective ex-situ treatment technologies, U.S. EPA does not agree that in-situ arsenic treatment should be evaluated further.

The commentor believes the proposed groundwater remediation plan does not adequately address the southern portion of the groundwater plume (attachment A, pg. 11, par.3). As discussed previously, U.S. EPA will evaluate the need to further characterize the southern extent of the plume as part of the remedial design activities. If needed, additional long-term monitoring to support natural attenuation for this portion of the plume may be required.

The commentor states that the impact of the proposed groundwater remedy on the beach and OMC property was not discussed in the FS and that the FS should be revised to include such an evaluation and that the impact should be contrasted against less intrusive in-situ treatment methods (attachment A, pg. 11, par. 4). The impact of the proposed remedy on the use of the beach and the OMC property is minimized by the use of a treatment cell concept. This method ties up only small areas of the beach or OMC property at any one time so that the effect on land use is minimized. Further evaluation of the effect on beach or OMC property use in the FS is not considered essential and would further delay site remediation. In-situ treatment methods were previously discussed and are not considered viable for the WCP site.

The commentor states that the FS did not evaluate the form of arsenic in groundwater and the risks posed to human health and ecological receptors and arsenic's impact on the remedy

(attachment A, pg. 12, par. 1). U.S. EPA evaluated the human health impacts of arsenic in the Final Technical Memorandum, Waukegan Manufactured Gas and Coke Plant Site Human Health Risk Assessment, November 14, 1995. An acute lethal risk was identified for ingestion of arsenic contaminated groundwater on-site. There may be some differences in toxicity between trivalent and pentavalent forms of inorganic arsenic (trivalent may be slightly more toxic), but convention has been to assume that they are equitoxic when performing a risk assessment since the differences in potency are small and the forms tend to be interconverted in the environment as well as in the human body (ATSDR Toxicological Profile for Arsenic, 1993). For the fish ingestion assessment, the differences in toxicity between organic arsenic and inorganic arsenic was factored in because organic arsenic is not carcinogenic. In both animals and humans, arsenate (As+5) is reduced to arsenite (As+3) which is then methylated to organic forms of arsenic.

Ecological risks were evaluated in the Final Technical Memorandum, Waukegan Manufactured Gas and Coke Plant Site Screening Ecological Risk Assessment. Arsenic was not retained as a COC for ecological risks because ecological receptors are not exposed to groundwater and arsenic is not present, or projected to be present in the future, in surface water at concentrations exceeding surface water quality criteria for aquatic life. The FS includes remedial objectives addressing the arsenic groundwater contamination as well as the other COCs. The dissolved arsenic in the groundwater will be treated to discharge standards using metals precipitation. The form of arsenic will be evaluated as part of remedial design if the form is determined to be important for selection of the method of precipitation or the dose of added chemicals.

The commentor believes that the FS is, not clear on the rationale used to define groundwater remediation (attachment A, pg. 12, par. 3). Groundwater remedial objectives are discussed in the FS Section 3.3 and include objectives to prevent exposure, minimize migration, and reduce the area of impact of groundwater contamination. The groundwater treatment remediation zone selection is discussed in Section 4.3.2.1. of the FS. The target zone was selected as the 20 mg/l arsenic contour because this represented the area of highest arsenic, phenol and ammonia concentrations. Ammonia and phenol are important to target because they have the greatest potential to cause exceedance of surface water standards. Arsenic is included because it greatly exceeds the groundwater standard of 50 ug/l and is important relative to reducing the area of impact of groundwater contamination.

1.5.3 OMC Comments in Attachment A -Additional Comments

1. Appendix 2-C of the FS presents an analysis of the effect of peninsular groundwater hydraulics on groundwater flow and chemical distribution. As part of this analysis, there is an assumption made that aqueous discharges from the site occurred from 1928 until site grading after building demolition in 1972. Given the information presented in the "Understanding of Historical Operations" section above, it is clear that the arsenic discharges at the site would have ended in approximately 1947. Consequently the analysis presented in Appendix 2-C needs to be redone to account for this shortened arsenic discharge period. OMC also questions the use

of chloride as a conservative surrogate for the analysis, since the chloride source areas and discharge duration have not been identified

U.S. EPA does not agree that the modeling documented in Appendix 2-C needs to be redone to account for different periods of discharge for arsenic compared to other site contaminants. The purpose of this modeling was to evaluate whether the observed stratification in the plume was explainable by groundwater hydraulics and to evaluate the effect of beach accretion and other site changes on groundwater flow patterns. The overall conclusions of the modeling were of a very general nature. The model was not run for arsenic specifically and re-running the model for arsenic would not change the overall conclusions that: 1) stratification is explainable by groundwater hydraulics, 2) the groundwater discharged in the past through the present dunes area, 3) movement of the beach eastward has enhanced attenuation of the plume and 4) the plume discharges within 250 feet of the shore. In addition these conclusions do not have a large effect on either the need for groundwater remediation or the design of the groundwater remediation system.

2. Appendix 3-C of the FS presents the process used to calculate the target soil concentration (TSC for arsenic for protection of groundwater A 25 mg/kg value is calculated as the site-specific TSC. We believe this value is too restrictive- the Tier 1 value provided in the Illinois TACO regulations, which is pH dependent, ranges from 25 to 31 mg/kg for Class I groundwater. The calculated mean pH for the available surface soil data is 7.8 +/- 1.3; this corresponds to an arsenic cleanup objective of 31 mg/kg, which would be more appropriate TSC. This issue needs to be evaluated in the FS.

U.S. EPA believes the method used to develop an arsenic TSC for protection of groundwater is more accurate than the method using soil pH alone. The method used is site-specific and thus takes into account the inherent variability in soil geochemistry. Also the difference in results of the methods are relatively minor.

3. The remedy proposed under Alternative 3 effectively eliminates the groundwater ingestion pathway (i.e., the remedy will satisfy all the criteria for eliminating the groundwater ingestion exposure route under the Illinois TACO regulations). Consequently, the soil cleanup objectives for protection of groundwater for arsenic or any other contaminants of concern do not need to be considered when determining remedial action objectives. We believe that the use of the arsenic soil cleanup objective for the protection of groundwater as a remedial action objective needs to be reevaluated in the FS.

Source control is an essential element of remediation under CERCLA and the NCP. Control of further releases to the groundwater is an important remedial objective and is specifically listed within the U.S. EPA TI guidance (see FS Section 3.3).

4. Within the Proposed Plan and the FS, there are several discussions regarding the contaminants of concern within the site groundwater. The listing of contaminants vary between discussions -for example, the Executive Summary of the Feasibility Study states that the

impacted groundwater has elevated concentrations of arsenic, phenols and ammonia, while the proposed plan states that the major contaminants of concern within the groundwater are arsenic, benzene, phenol, thiocyanate and ammonia. The documents need to be revised to ensure that they are consistent and clear as to which contaminants within the site groundwater are considered to be a concern.

The FS Executive Summary and the Proposed Plan do not list all the contaminants of concern exceeding drinking water standards. The FS Executive Summary states that “the groundwater has elevated concentrations of arsenic, phenols and ammonia”. This statement is not intended as a listing of COCs but as an executive summary of the most important contaminants relative to the FS. The Proposed Plan, under the subheading Remedial Investigation Results, states that “the major contaminants of concern are benzene, phenol, thiocyanate and ammonia”. This is intended as a list of the most significant COCs found in the RI. As a result, the statements are not inconsistent.

5. In Section 3.2.3 of the FS, there is a statement that the soil at the site is not a RCRA hazardous material. This statement is not correct - one of the waste characterization samples collected during the RI (sample TT2401) failed the TCLP for benzene (in addition it is more appropriate to refer to RCRA hazardous waste, not hazardous material). This portion of the text needs to be rewritten to reflect all waste characterization results, and should also discuss the U.S. EPA guidance related to the management of MGP-related hazardous waste, which is provided as part of the current administrative record.

The statement referenced is correct although it should use “waste” rather than “material”. The soil can only become a characteristic waste if it is excavated- it is not a characteristic waste in the ground. The second sentence of the referenced paragraph states: “However, if a portion of the soil is removed from the site for treatment, this soil may need to be tested to determine if it exhibits any hazardous waste characteristics.” As part of the proposed remedy, hazardous waste characteristic testing is planned for soils excavated for treatment.

6. Appendix 2-D of the FS presents an analysis of the effect of groundwater mixing with surface water and the potential effects of groundwater discharges on surface water quality. However, there is no discussion on how the predicted surface water concentrations compare to the measured concentrations, and if this comparison supports the mixing ratios proposed by the model. This discussion should be included in the FS. Furthermore, there needs to be additional discussions regarding how these modeled concentrations relate to the groundwater remedial action objectives.

Limited surface water sampling was available at the time the FS was being prepared, making a comparison of predicted and measured concentrations difficult. Subsequent to the estimates presented in Appendix 2-D, additional Lake Michigan surface water sampling was performed and data was made available to U.S. EPA on November 20, 1998. Ammonia equaled or exceeded the Lake Michigan water quality standard of 20 ug/l in three of 30 lake Michigan nearshore zone samples. A comparison of the mean groundwater ammonia concentration below the beach zone

to the maximum ammonia concentration in the nearshore zone of 70 ug/l results in a dilution of 15,000:1. This is comparable to the modeled dilution, which ranged from 2,900:1 to 22,000:1 (see FS Table 2-D-7). While the near shore zone ammonia data is consistent with the discharge of the ammonia from the plume, other sources of ammonia are present in the area. Ammonia is typically elevated in organic sediments as a result of natural biodegradation. Also discharges of ammonia from other sources such as the North Shore Sanitary District could effect nearshore zone ammonia. As a result U.S. EPA will require additional monitoring of surface water and groundwater as part of the proposed remedy. Revisions to the FS are not necessary because they would not effect remedy development or evaluation.

7. In Appendix 3-A of the FS, there is a statement made that constraints are in place to prohibit placement of individual water wells, which will eliminate the groundwater ingestion pathway. Under the Illinois TACO regulations, there are specific procedures which must be followed to prohibit the use and installation of potable water wells, including the requirement for the local government to pass an ordinance that meets specific goals set out by the Illinois EPA. The procedures provided in TACO to formally eliminate the groundwater ingestion pathway should be discussed in the FS and incorporated into the Proposed Plan.

Measures to prohibit installation of potable wells will be a requirement for implementing the institutional controls portion of the remedy. The appropriate process will be followed for the institutional control implementation.

8. In appendix 4-F of the FS, a cost for an HDPE geomembrane is included in the cost estimate for an asphalt cap. The use of a membrane in conjunction with the asphalt cap is not discussed in detail with the FS. Given the significant cost of the membrane, the use of the membrane with the asphalt cap needs to be justified and discussed in the FS.

The HDPE geomembrane was included as part of alternative 3 that was one of seven soil media alternatives developed and screened in Section 4 of the FS. The alternative is composed of only an asphalt cap for the entire site. A geomembrane was included in this alternative to increase the reliability of the cap because no other remediation for the soils was included in this early alternative. Note that this alternative was screened out (see FS Table 4-8) and is not the same as the Alternative 3 developed for detailed evaluation. The proposed remedy alternative 3 includes a phytoremediation cap with the potential to convert portions to asphalt cap depending on site development needs. The FS and proposed remedy do not specify the details of a potential asphalt cap.

9. In appendix 5-A of the FS, there is a discussion that transportation of PAH-impacted soils to the Illinois Power facility near St. Louis, Mo would be less complicated if trucks were used as opposed to a barge. The cost estimates presented in the FS apparently use costs for trucking the soils to Illinois Power. Given the relatively large volume of soil and the accessibility of water and rail transportation, the cost to transport the impacted soils via barge or rail should be considered in the FS.

The transportation method for getting the soil to the treatment facility is not specified in the proposed plan and will be determined during remedial design. FSs need not determine all the details of the design, but rather must provide a representative option for such items as transport method.

10. *As discussed in the “1998 Waukegan Harbor and Lake Michigan Surface Water Sampling, Waukegan Manufactured Gas and Coke Plant Site “ Work Plan, the field parameters of pH, conductivity and temperature are to be recorded every 5 minutes after a stable pumping rate is established. Once three consecutive readings and 30 gallons of water have been purged, the surface water sample may be collected. Documentation of the field parameter measurements needs to be provided in the FS, and compliance with the requirements of the Surface Water Sampling Work Plan needs to be discussed.*

U.S. EPA has not required that all the details of post RI sampling be documented in published reports. If U.S. EPA has reason to believe that sampling methodology has caused inaccuracies in results, the documentation is requested. U.S. EPA has no reason to believe that the surface water samples have been collected inappropriately.

11. *A spot check of field parameters associated with the July 7, 1996 groundwater sampling event indicated that approximately 37% of the monitoring wells had not stabilized at the time of sampling. The criteria used to verify stabilization is outlined in the July 1, 1991 Sampling and Analysis Plan.” An explanation needs to be provided in the FS as to why monitoring wells were not allowed to stabilize in all cases.*

It is unclear as to which data this comment is referring. The FS presents groundwater sampling data for July 17, 1996, but there are no sample results for a date of July 7, 1996. Assuming that the comment meant to refer to July 17, 1996 groundwater sampling, field parameter results are presented on Table 2-2 of the FS. However these are sampling results, not results taken during purging of the well for determining when the well water has stabilized.

12. *Groundwater and surface water sampling was conducted by Bar engineering during the time period July 15 through 19, 1996 and documented in a sampling report dated August 9, 1996. A comment in the “Waukegan Sampling Notes” references a soil sample collected 200 feet east of monitoring well nest MW-13. The soil sample was obtained by excavating down to the water table and collecting six 8- oz. containers filled with water saturated soils. In addition, the note states that the samples were sent to GTI. Based on review of the procedures in GTI’s treatability study, no site soils were specifically identified. These soils do not represent aquifer conditions in the region of the groundwater impacts. The use of these soils and associated analysis need to be discussed in the FS.*

The area east of MW-13 is on the beach in the area of the concentrated portion of the groundwater plume. Two hundred feet east of MW-13 is SB-63 where groundwater grab samples contained the following levels of contaminants: ammonia - 1,060 mg/l, phenol - 430 mg/l and arsenic - 50.8 mg/l. It is clear that the referenced soil sample was collected from the region of

groundwater impacts.

13. The human health risk assessment was developed using a screening approach to identify constituents of potential concern (COPCS). The COPCs were selected if the individual constituent excess risk, exceeded 10^{-6} or that the non-cancer risk contributed 1 percent of the total risk. The risk assessment then evaluated potential exposures and risks to constituents exceeding the screening levels. This approach would be acceptable except that in the FS, the target risk levels for individual constituents were set at 10^{-5} and the cumulative risk could exceed the target level. As a result, the screening procedure in the risk assessment should have been reviewed to ensure that all constituents with screening levels of 10^{-7} , or higher were considered in developing the soil cleanup levels. Under the Illinois TACO regulations, the acceptable risk level is 10^{-6} under Tiers 1 and 2, with some flexibility for acceptable risk under Tier 3. Following the Illinois regulations justification for the higher target risk for the higher target risk level should be provided. This was not done in the FS, additionally the Illinois regulations require that the target risk level be met at the exposure point. This would imply that this would be a cumulative risk rather than the individual constituent risk. Therefore, the FS should be revised to indicate that the risks fall within acceptable risk range that will meet all appropriate ARARS.

The methodology used in the screening of chemicals to identify COPs is the standard method in the U.S. EPA Risk Assessment Guidance Manual. The target risk levels for individual constituents that were set at 10^{-5} risk levels define the areas for active remediation. These areas were identified through a combination of contaminant mass versus volume and risk levels as discussed in the FS Section 4.3.1.3. Contamination remaining following excavation and treatment of the soils would pose a risk of less than 10^{-5} for individual constituents and is expected to be below 10^{-4} cumulative risk. Because the entire site is to be covered with the phytoremediation cover, exposures to site soils are prevented and the public is protected to below 10^{-6} cumulative risk.

14. Groundwater data have been collected since the risk assessment was prepared in 1995. The data used in the risk assessment should be compared with the more recent data to ensure that conditions at the site are accurately characterized. It is possible that conditions at the site have improved over time and that the risks identified in the risk assessment overestimate actual or hypothetical risks at the site. Thus a discussion needs to be provided in the FS that documents that the risk assessment inputs have not changed sufficiently to require calculating site risks.

Additional data has been collected since the RI for groundwater. The risk assessment found the groundwater to be acutely lethal. Arsenic levels have not shown consistent trends since the RI to this assessment. Because there is no change in the risk assessment conclusions, the FS does not require modification.

15. The FS develops target cleanup levels for three scenarios: reasonable maximum (RME), central tendency (CTE), and representative high exposure (RHE). In each case the exposure assumptions are developed based on a combination of U.S. EPA default assumptions and

professional judgment. The RHE does not appear to be a scenario that is outlined in either U.S. EPA guidance or Illinois regulations. The RHE case appears to be the preferred approach for developing cleanup levels in the FS. The exposure assumptions used in this scenario are a combination of conservative and realistic assumptions. Because the assumptions are different and the target risk level greater, the cleanup levels developed for the RHE tend to be higher than those corresponding to the other scenarios. The use of the RHE may also result in cleanup levels exceeding the Illinois EPA acceptable risk level when considering additive effects from exposure to different constituents (see above). Justification for the use of RHE and its underlying assumptions needs to be presented in the FS.

The justification for use of RHE is presented in the FS section 3.2 and Appendix 3-B. As discussed under the response to comment 13, the target risk levels for individual constituents that were set at 10^{-5} risk levels define the areas for active remediation. Contamination remaining following excavation and treatment of the soils would pose a risk of less than 10^{-5} for individual constituents and is expected to be below 10^{-4} cumulative risk, if exposures were to occur. Because the entire site is to be covered with the phytoremediation cover, exposures to site soils are prevented and the public is protected to below 10^{-6} cumulative risk.

16. Arsenic toxicity to wildlife is dependent on its form. The risk assessment indicated that only 20 percent of the total arsenic at the site was likely present in the inorganic form. Without presenting information on the source of the arsenic, this conclusion may be erroneous. Some data were available indicating that arsenic was present more in the pentavalent form. The possible impacts of arsenic on ecological receptors should be reevaluated in the FS to more clearly account for arsenic's form in the environment.

See the above response to comment 5 of the OMC Comments in Attachment A to Letter Dated April 23, 1999, (attachment A, pg. 12, par. 1). Also, the assumption of 20% inorganic arsenic was only made for the human health fish ingestion pathways. The ecological risk assessment assumed all the arsenic was the more toxic inorganic form.

17. The risk assessment performed for the site needs to be revised to consider a possible residential redevelopment (see discussion under "Redevelopment Issues" above).

A residential land use scenario was evaluated in the risk assessment. As discussed under the Response to OMC Attachment A Comment 2, the FS reevaluated future land use and found that industrial land use was the most likely future use of the site.

18. Appendix 3-B of the FS discusses the development of target soil concentrations protective of human health. Throughout this discussion, there is reference to Illinois EPA guidance, and a specific statement that the Illinois guidance provides a cancer target risk value of one excess cancer in one-hundred thousand over background risk level for the cancer endpoint. The specific Illinois/EPA guidance should be referenced (if the TACO regulations are being referenced, these are regulations, not guidance), and the use of 10^{-6} excess cancer risk by the State of Illinois needs to be better substantiated

Appendix 3-B references U.S. EPA guidance extensively in the development of target soil concentrations. The single reference to State of Illinois guidance appears on page 3-B-6. The lack of a specific reference for the statement that Illinois guidance uses 10^{-5} is not central to the development of TSCs because U.S. EPA requires that the risk range from 10^{-4} to 10^{-6} be considered.

19. Appendix 4-A of the Feasibility Study provides a preliminary evaluation of the effectiveness of the proposed vadose zone soil remediation. Throughout this discussion, there is reference to a 10^{-4} RHE soil risk levels. However, in Appendix 3-A, a 10^{-5} excess cancer risk appears to be used. This discrepancy needs to be explained.

As discussed on the FS pg. 4-A-1, the objective of the appendix was to present a methodology for soil confirmation sampling and an estimate of the residual risk posed after excavation of the target soil areas. The excess cancer risk level of 10^{-4} discussed is for the commercial/industrial exposure setting, while the areas targeted for remediation are based on a 10^{-5} utility/construction worker exposure setting.

APPENDIX C

STATE OF ILLINOIS CONCURRENCE LETTER



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276

THOMAS V. SKINNER, DIRECTOR

217/782-3397
217/782-9143 TDD

September 28, 1999

RECEIVED
OCT 08 1999

SUPERFUND DIVISION
OFFICE OF THE DIRECTOR

Mr. William E. Muno
United States Environmental Protection Agency - Region 5
Superfund Division
Mail Code (SR-6J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3390

Re: L0971900047 Lake
Waukegan Manufactured Gas and Coke Plant
Superfund/ Technical Reports

Dear Mr. ^{B-11}Muno:

On September 14, 1999, the Illinois Environmental Protection Agency received a Revised Draft Record of Decision ("ROD") for the Waukegan Manufactured Gas and Coke Plant. This transmittal is intended to serve as the State's concurrence on the ROD.

If you should have any questions, or require any additional information regarding this matter, please contact Gerald E. Willman of my staff at (217) 524-6365.

Sincerely,

A handwritten signature in black ink, appearing to read "Tom".

Thomas V. Skinner
Director

LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
AWQC	ambient water quality criterion
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	constituents of potential concern
CSF	Cancer Slope Factor
CTE	central tendency exposure
cys	cubic yards
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DRO	Diesel Range Organics
ERA	ecological risk assessment
EPC	exposure point concentration
FS	Feasibility Study
ft/day	feet per day
ft/ft	feet per feet
ft/yr	feet per year
GMZ	Ground water Management Zone
gpm	gallons per minute
HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
IAC	Illinois Administrative Code

IEPA	Illinois Environmental Protection Agency
IRIS	Integrated Risk Information System
L/kg	liters per kilogram
LDR	land disposal restriction
MCLG	Maximum Contaminant Level Goal
MCLs	maximum contaminant levels
mg/kg	milligram/kilogram
mg/L	milligram/liter
MTRs	minimum technology requirements
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effect-level
NPL	National Priorities List
O&M	Operation and Maintenance
OMC	Outboard Marine Company
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyls
ppb	parts per billion
pph	pound per hour
ppm	parts per million
PRGs	Preliminary Remediation. Goals
PSCS	Preliminary Site Characterization Summary
PVC	polyvinyl chloride
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
rd	Reference Dose

RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
S.U.	Standard Units
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
sft ³ /min	standard cubic feet per minute
STP	standard temperature and pressure
TBC	to be considered
TI	technical impracticability
TMV	toxicity, mobility, and volume
TSB	Treatment, Storage, or Disposal
TSC	target soil concentrations
U.S. EPA	United States Environmental Protection Agency
ucl	upper confidence limit
ug/L	micrograms per liter
VOCs	volatile organic compound.
WCP	Waukegan Manufactured Gas and Coke Plant Site

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FIGURES

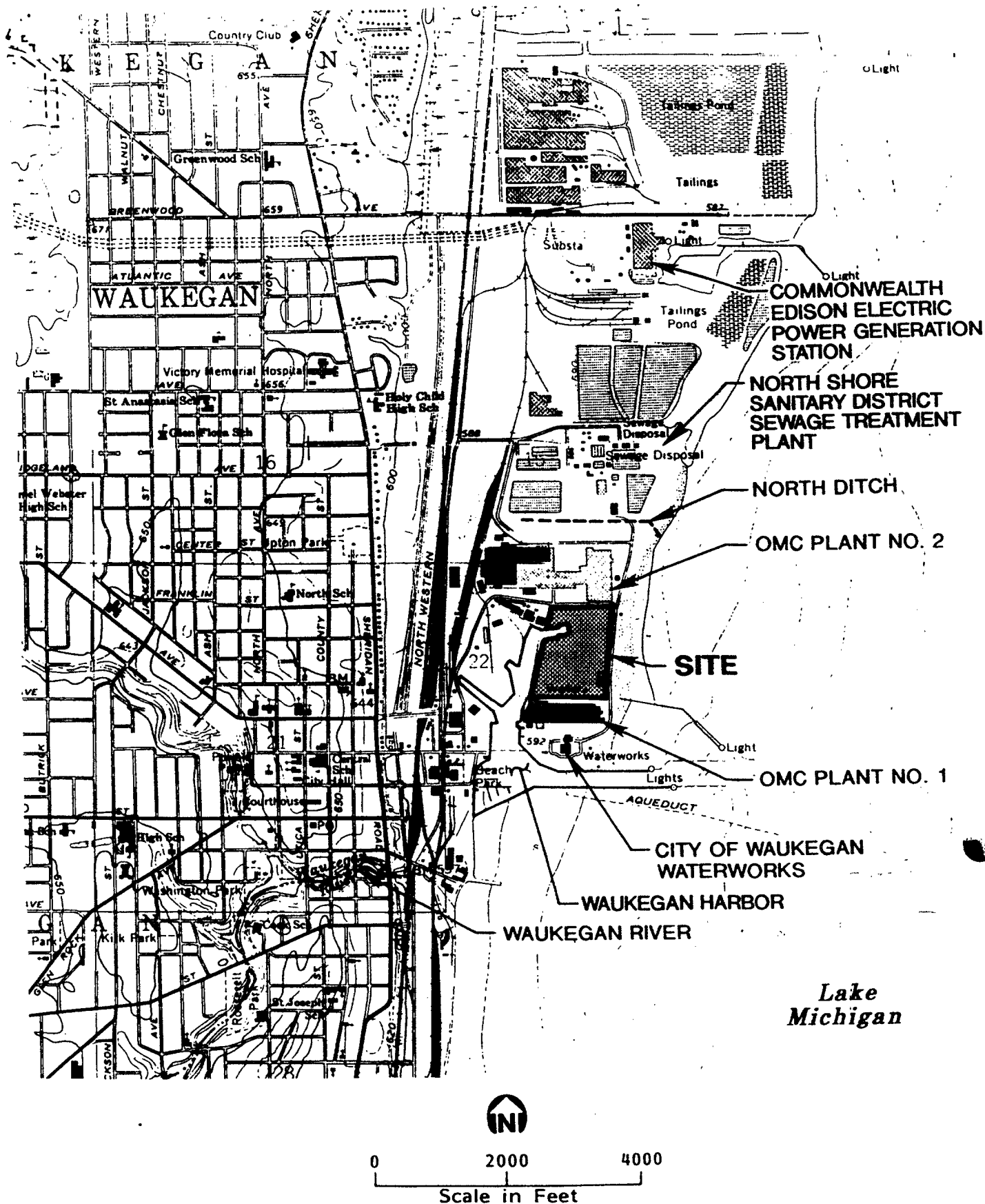


Figure 1.
 SITE LOCATION MAP
 Waukegan Manufactured Gas and Coke Plant

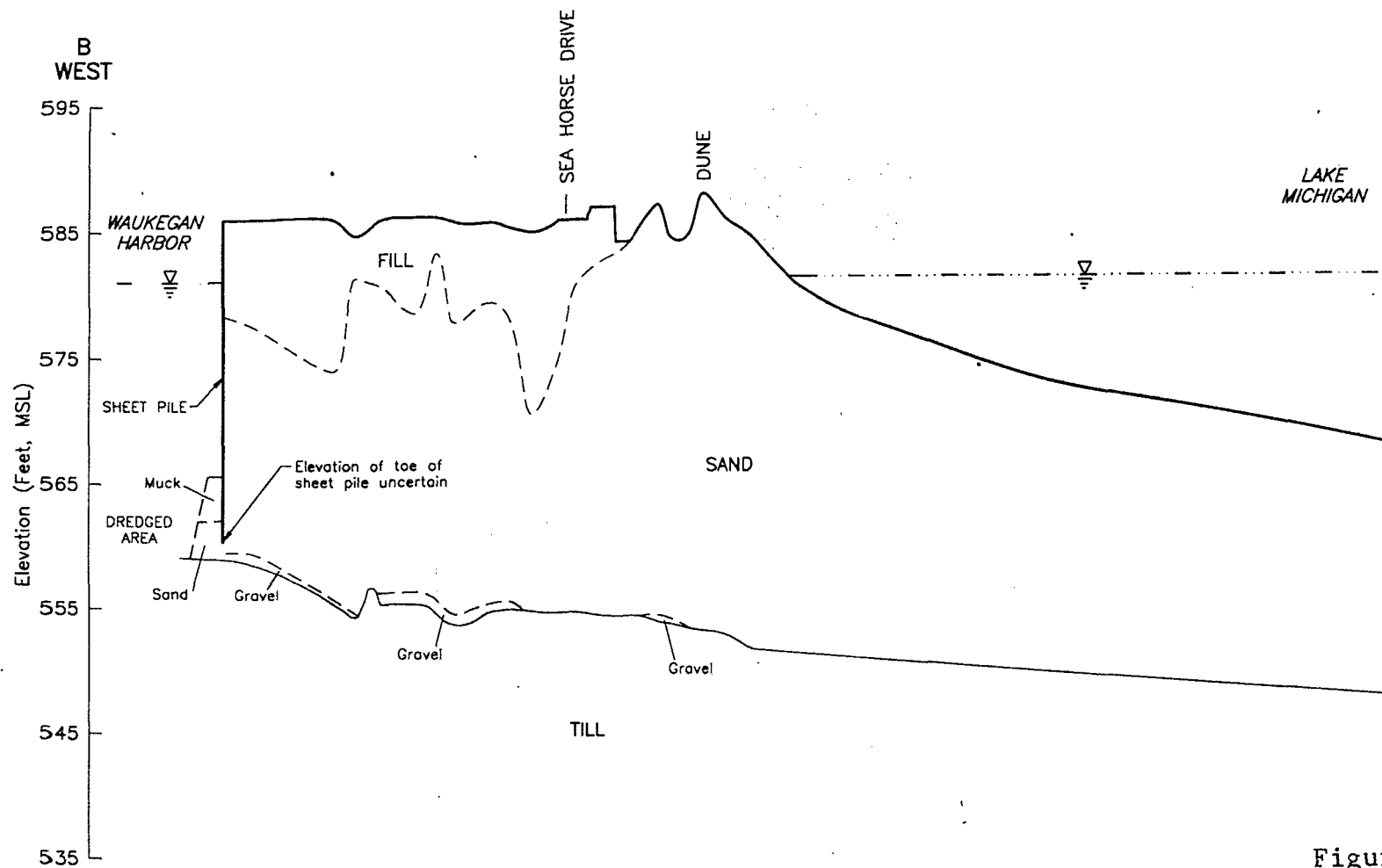
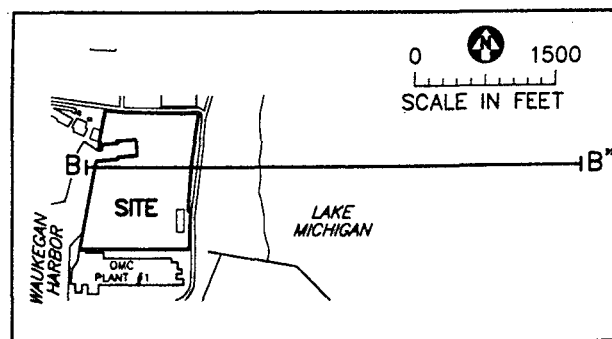
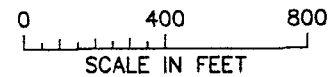
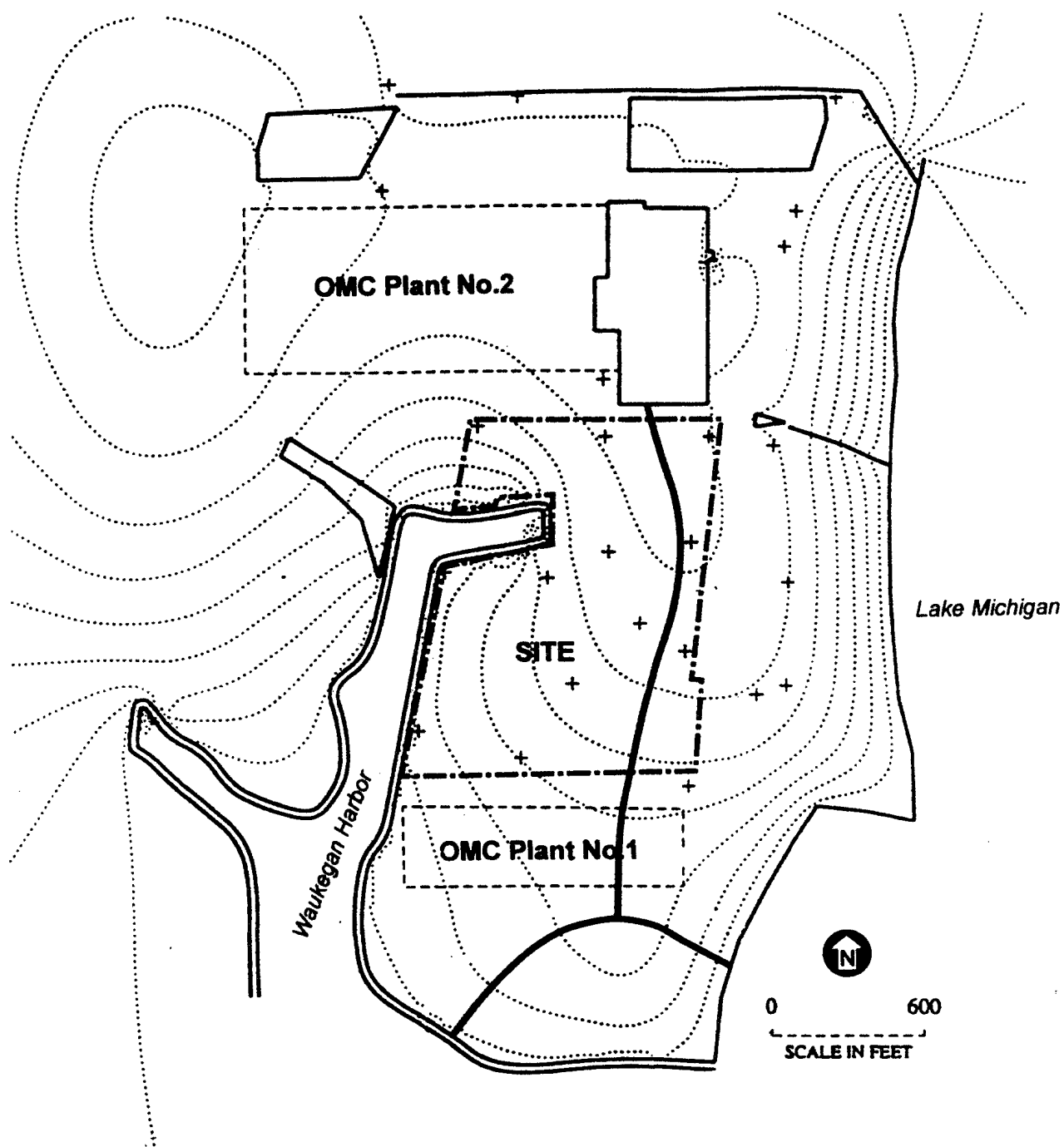


Figure 2.
Geological Cross Section



SITE AND CROSS SECTION LOCATION

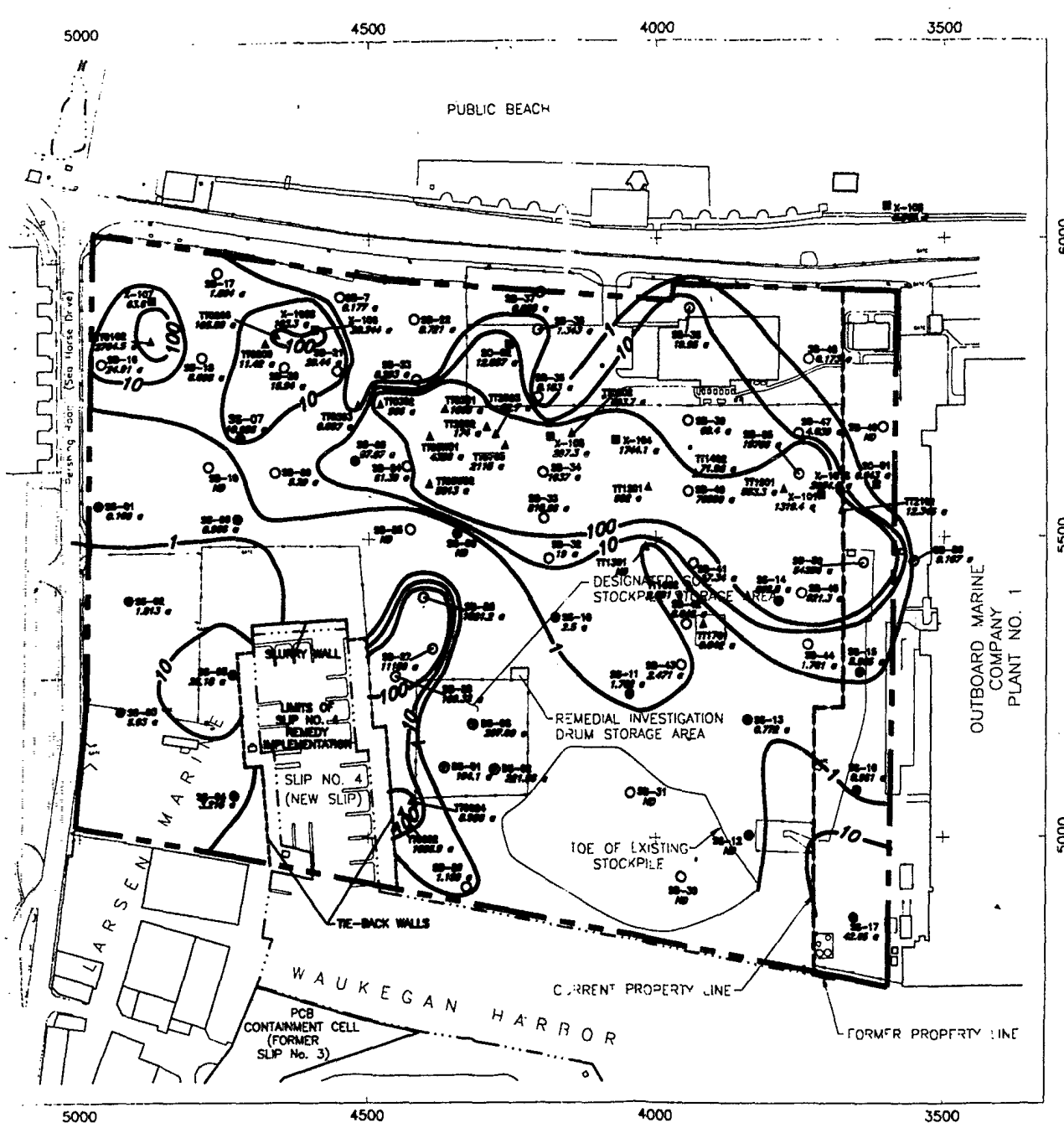




- Groundwater Surface Contours
(Contour Interval 0.25 feet)
- + Piezometer or Monitoring Well Location
- - - - - Site Boundary
- Groundwater Flow Divide

Figure 3

GROUNDWATER CONTOURS AND FLOW DIVIDES
(SLAEM GROUNDWATER MODEL)
Waukegan Manufactured Gas And Coke Plant



- 008-01 Designated Soil Stockpile Sample Location.
- X-108 Illinois Environmental Protection Agency Soil Sample Location
- 98-07 Surficial Soil Sample Location
- 98-01 Surficial Soil Sample Location
- ▲ T10804 Test Trench Sample Location
- 008-33 Soil Boring Location
- 2.5 Total PAH Concentration (mg/kg)
- ND Not Detected
- 10— Total PAH Concentrations (mg/kg) In S. (Contours Are Approximate)

NOTE:

See Analytical Data Tables In RI Report For Explanation Of Data Qualifiers.

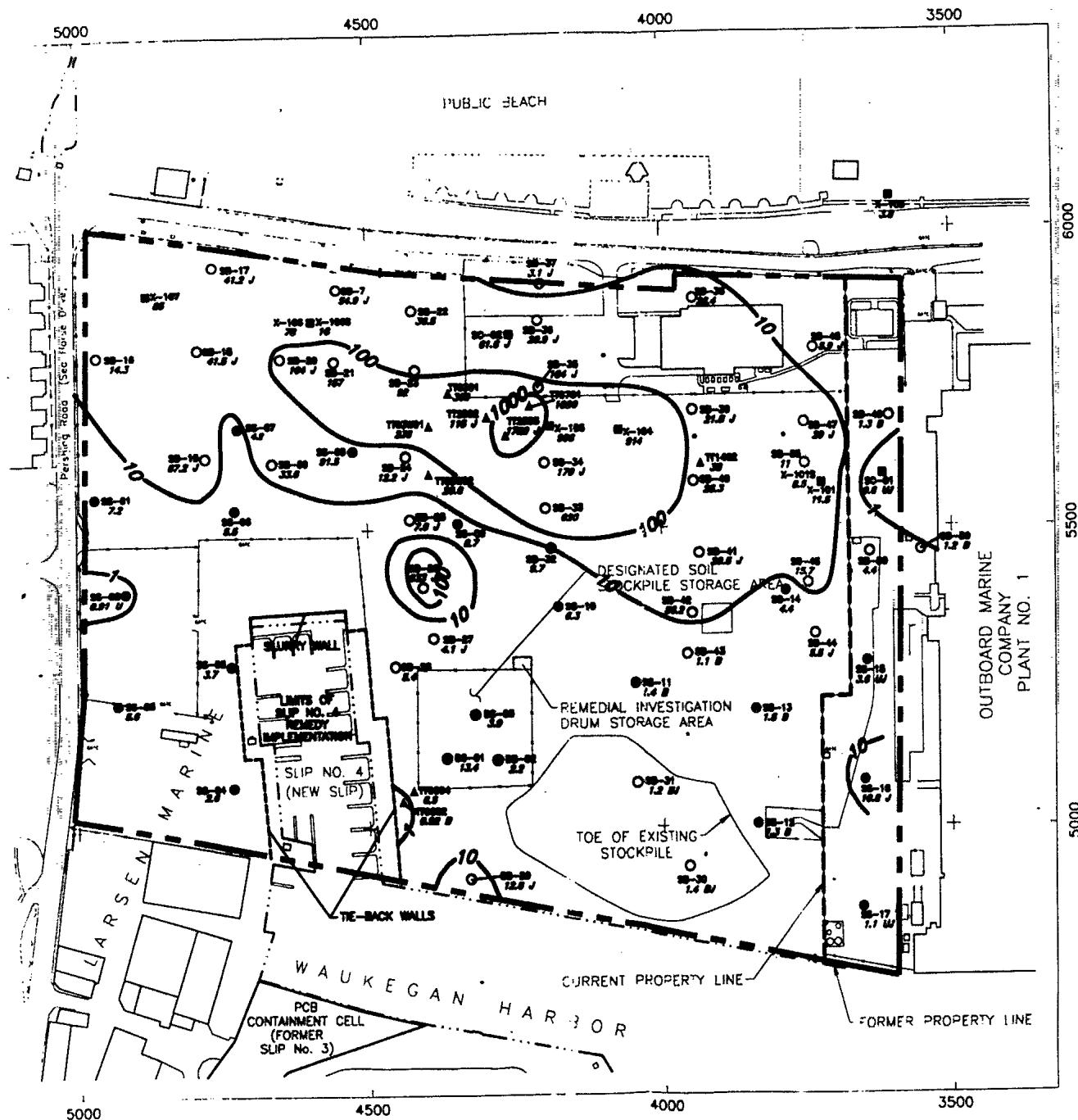
Soil Stockpile Concentrations Are Located At Depths Below The Base Of The Soil Stockpile

Designated Soil Stockpile Concentrations Are From Within The Containment Cell And Are Excluded From Contouring.

Sample Matrices And Concentrations Of Samples >1000 mg/kg TPAH

SAMPLE	TOTAL PAH CONCENTRATION	MATRIX
T10102	2794.5	Vadically Contaminated Sand
T103001	4398	Vadically Contaminated Industrial Pond Deposit
T103002	5013	Vadically Contaminated Sand
T10802	1006.8	Vadically Contaminated Soil
T10703	2115	Vadically Contaminated Soil
X-101	1318.4	Not Known
X-1015	2054.8	Not Known
X-104	1744.1	Not Known
98-26	1861.2	Coal And Coke Fines
98-27	11,130	Sand
98-34	1637	Vadically Contaminated Sand With Coal Fines
98-40	78,000	Vadically Contaminated Soil
98-50	54,250	Vadically Contaminated Soil
98-55	18,766	Vadically Contaminated Soil

Figure 4
DISTRIBUTION OF TOTAL PAH
CONCENTRATIONS IN VADOSE ZONE SOILS
DEPTH 0.5'-4.5'
Waukegan Manufactured Gas And Coke Plant



- SE-01 Designated Soil Stockpile Sample Location.
- SE-100 Illinois Environmental Protection Agency Soil Sample Location
- SE-07 Surficial Soil Sample Location
- SE-01 Surficial Soil Sample Location
- △ T70004 Test Trench Sample Location
- SE-33 Soil Boring Location
- 28.5 Arsenic Concentration (mg/kg)
- ND Not Detected
- 10— Arsenic Concentrations (mg/kg) in : (Contours Are Approximate)

NOTE:

See Analytical Data Tables In RI Report For Explanation Of Data Qualifiers.

Soil Stockpile Concentrations Are Located At Depths Below The Base Of The Soil Stockpile

Designated Soil Stockpile Concentrations Are From Within The Containment Cell And Are Excluded From Contouring.

Figure 5
DISTRIBUTION OF ARSENIC
CONCENTRATIONS IN VADOSE ZONE SOILS
DEPTH 0.5'-4.5'
Waukegan Manufactured Gas And Coke Plant

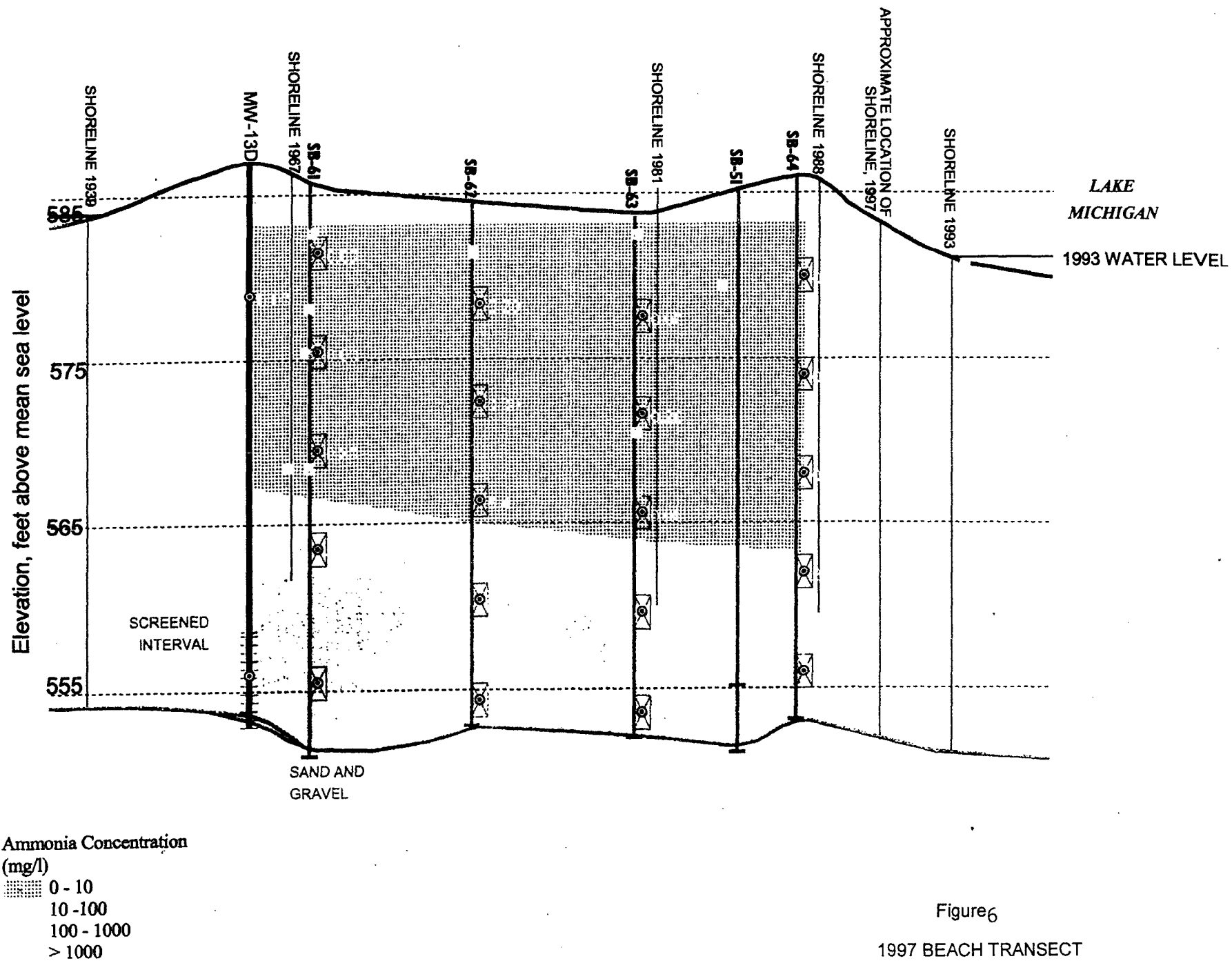
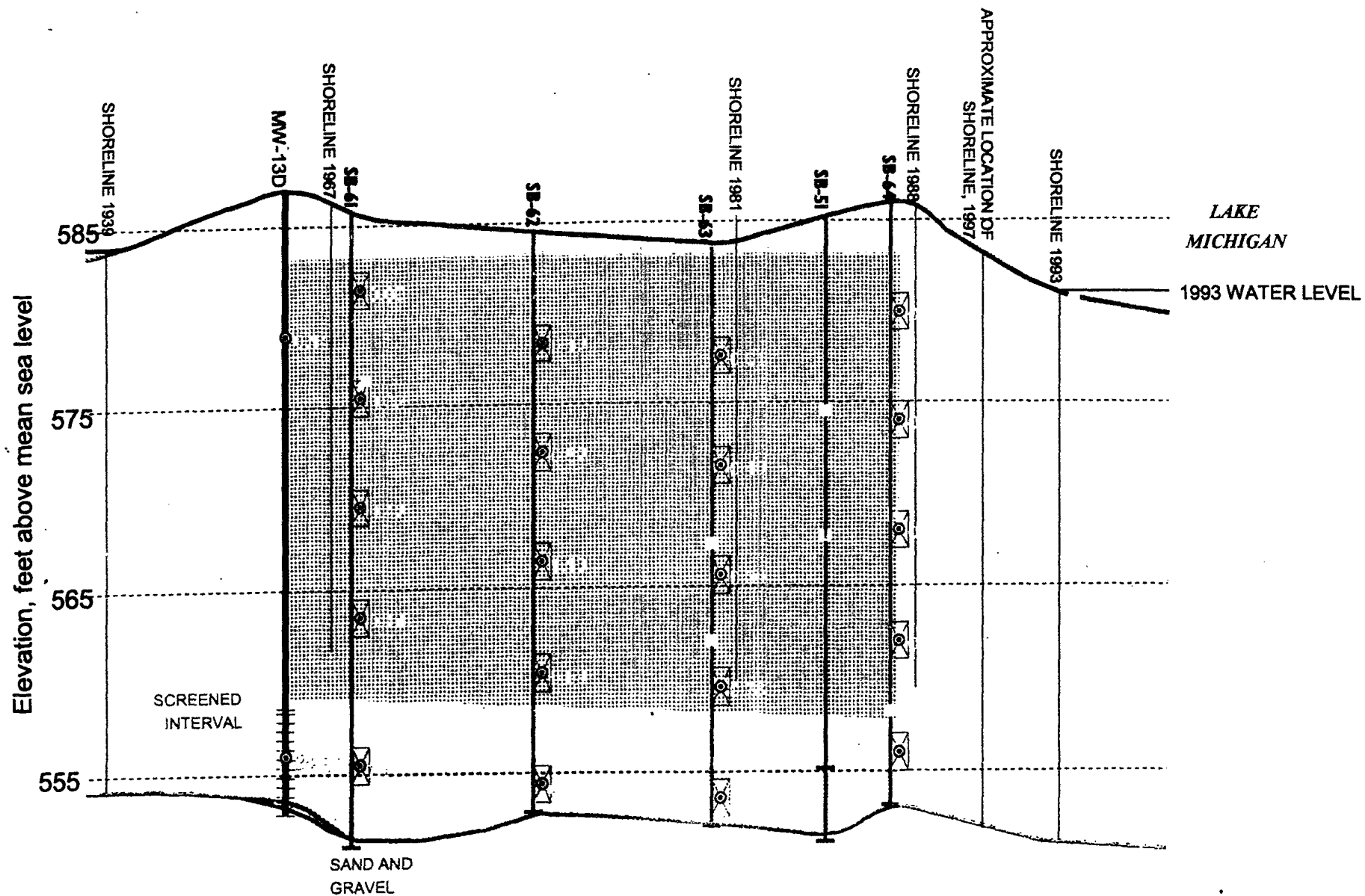


Figure 6
1997 BEACH TRANSECT
AMMONIA CONCENTRATIONS (mg/l)



Arsenic Concentration

(mg/l)

0 - 2

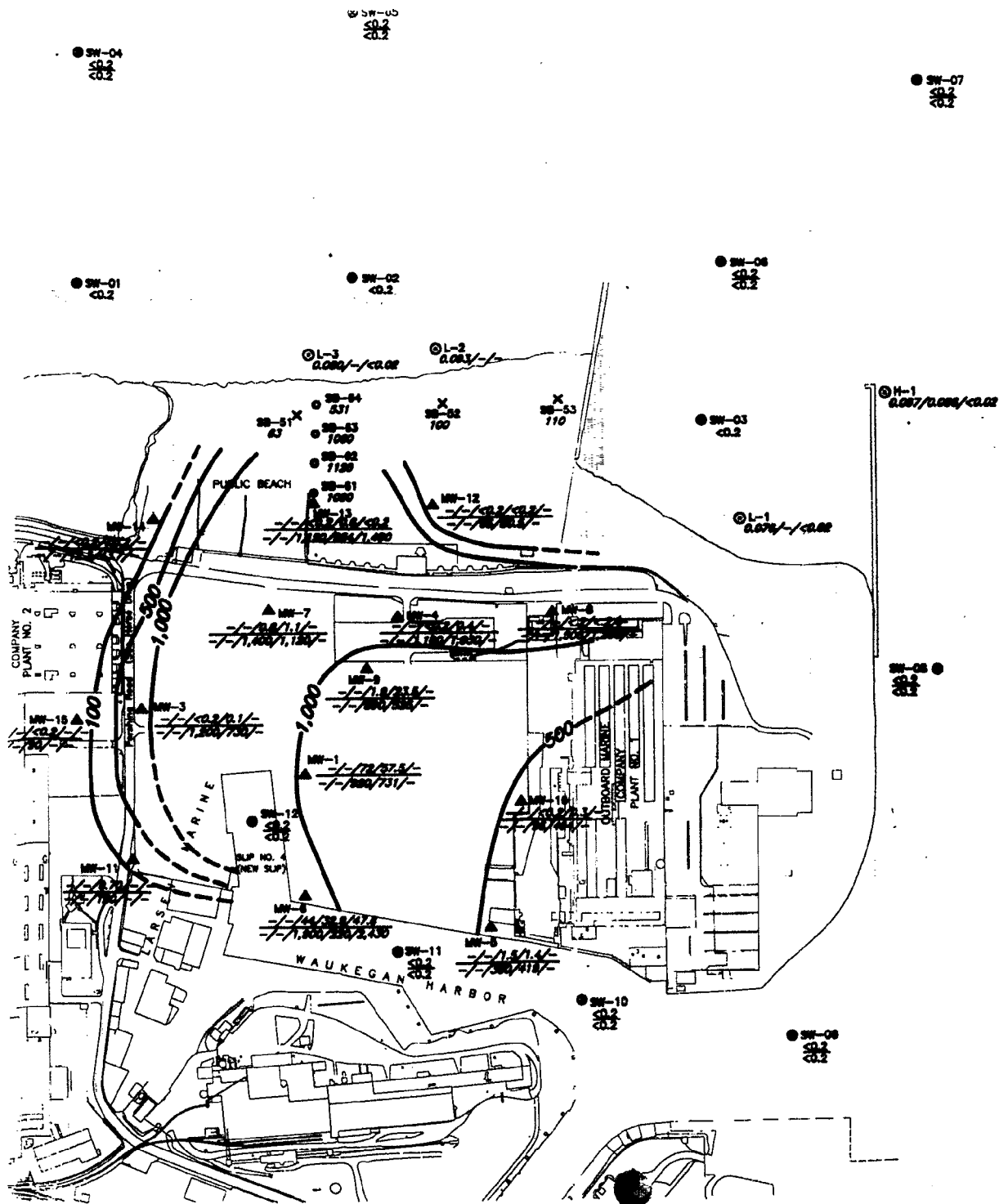
2 - 20

20 - 40

> 40

Figure 7

1997 BEACH TRANSECT
ARSENIC CONCENTRATIONS (mg/l)



SURFACE WATER

- SW-08 Surface Water Sample
August 1993

○ L-2 Shallow Sample
● L-2 Deep Sample

Note:
In Water Less Than 10 Feet Deep,
Only The Shallow Sample Was Collected.

- L-1 Surface Water Sample
H-1 July 1996/August 1996/Sept. 1997

GROUNDWATER

Soil Boring With Temporary Well
Point Sample (Deep Sample Collected)
September 1993
● SB-01
● SB-04 September 1997

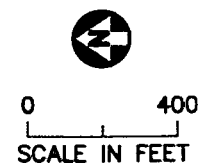
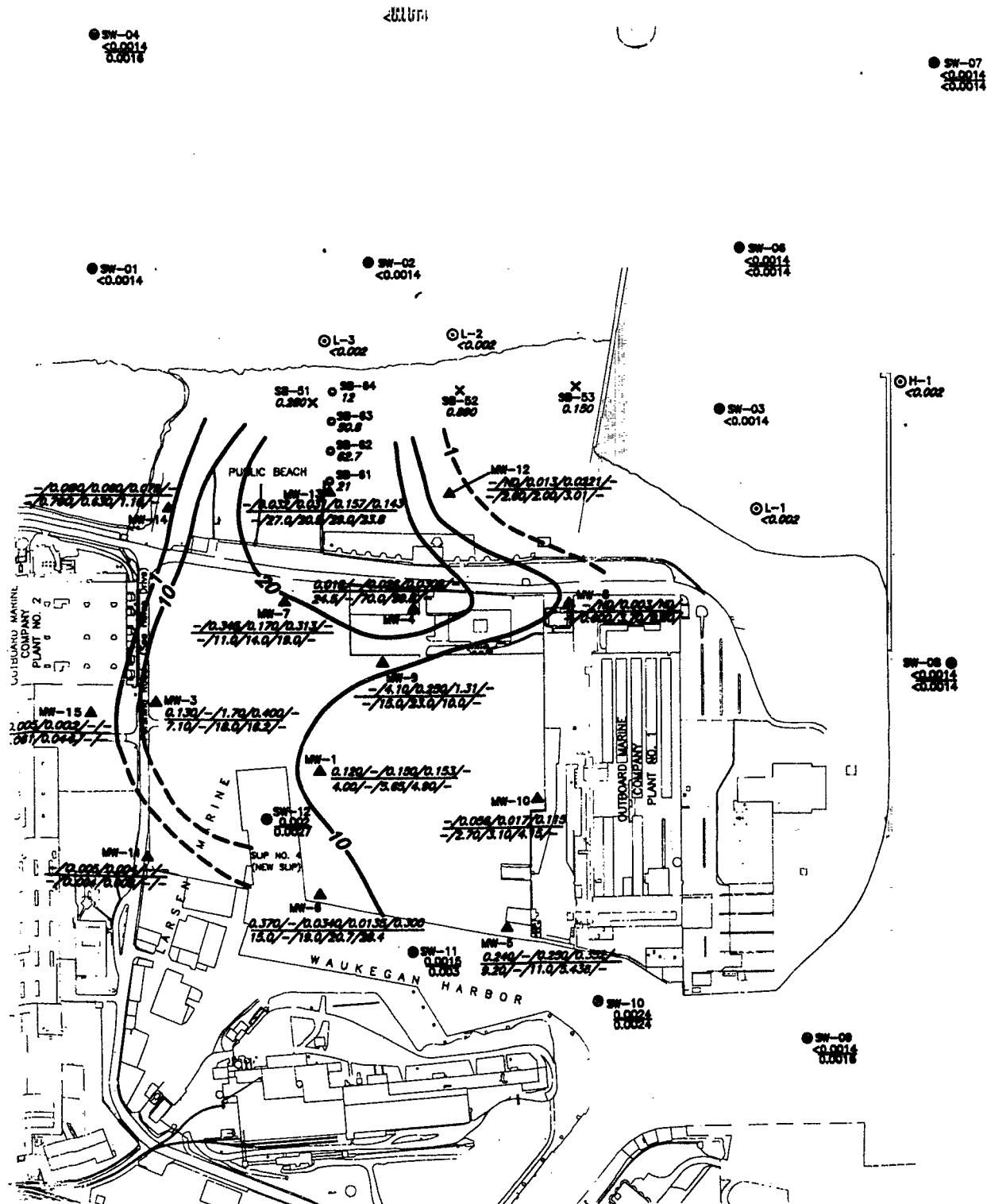
- ▲ MW-7 Monitoring Well Nest
Deep And Shallow Well Samples
April 1992/Sept.-Oct. 1993/
Nov.-Dec. 1993/July 1996/Sept. 1997
(Duplicate Results Are Averaged)

~~///~~ Sand Aquifer Shallow Well
Sand Aquifer Deep Well

- Not Sampled During Indicated Sampling Event

—100— Ammonia Concentration Contour (mg/L)
1996 Samples (1997 If Available)
For Deep Monitoring Wells And
1997 Temporary Well
Point Samples
(Dashed Segments Indicate
Lack Of Bounding Data)

Figure 9
AMMONIA CONCENTRATIONS IN GROUNDWATER
AND SURFACE WATER
(Concentrations in mg/L)
Waukegan Manufactured Gas And Coke Plant.



SURFACE WATER

- SW-08 Surface Water Sample
August 1993

0.0014 Shallow Sample
0.0014 Deep Sample

Note:
In Water Less Than 10 Feet Deep,
Only The Shallow Sample Was Collected.

- L-1 Surface Water Sample
July 1996

GROUNDWATER

Soil Boring With Temporary Well
Point Sample (Deep Sample Shown)
September 1993
September 1997

- X SB-51
- SB-54

- ▲ MN-7 Monitoring Well Nest
Deep And Shallow Well Samples
April 1992/Sept.-Oct. 1993/
Nov.-Dec. 1993/July 1996/Sept. 1997
(Duplicate Results Are Averaged)

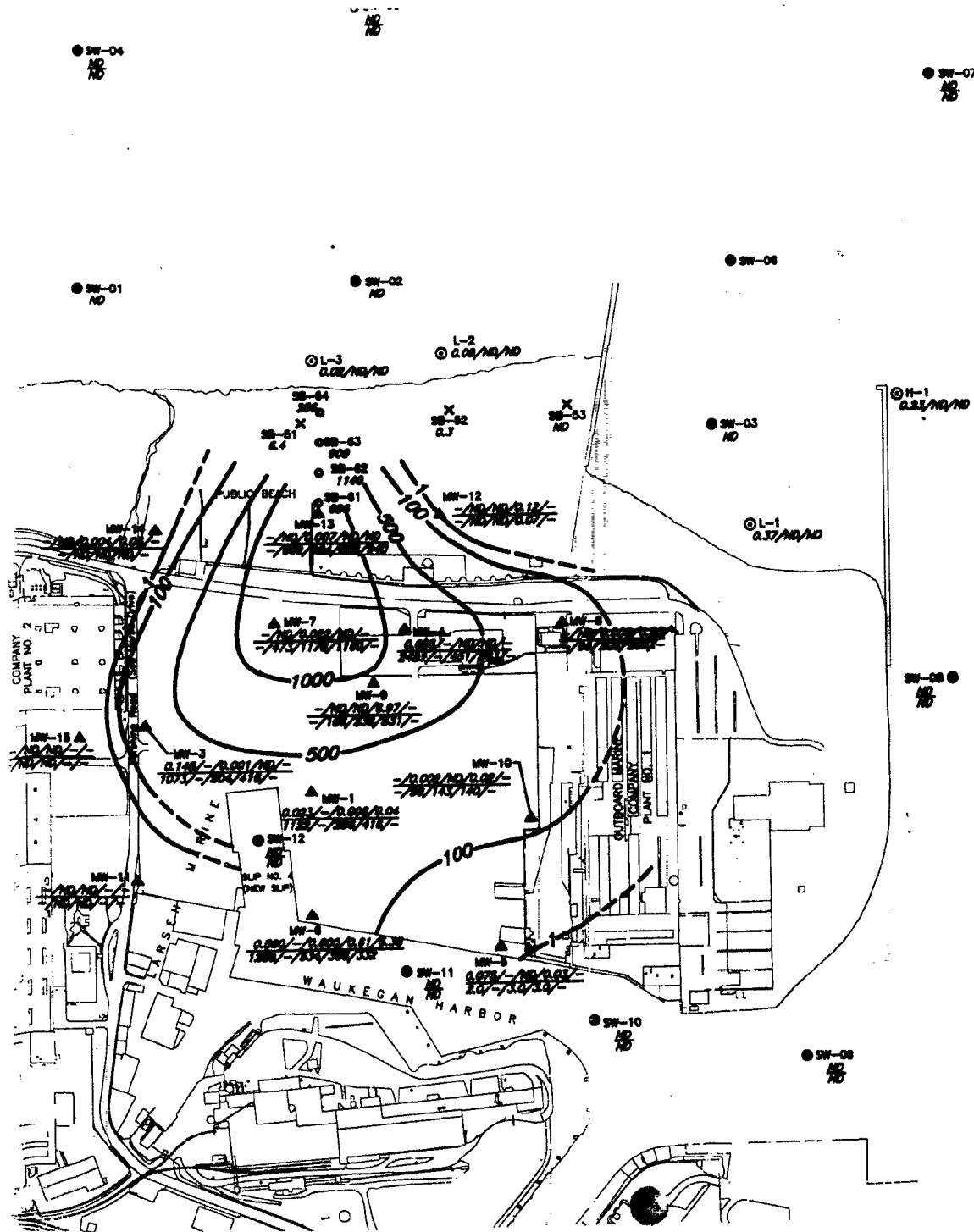
0.340/-/0.290/0.352/- Sand Aquifer Shallow Well
0.3/-/11.0/3.438/- Sand Aquifer Deep Well

ND Not Detected

- Not Sampled During Indicated Sampling Event

—10— Arsenic Concentration Contour (mg/L)
1996 Samples (1997 If Available)
For Deep Monitoring Wells And
1997 Temporary Well
Point Samples
(Dashed Segments Indicate
Lack Of Bounding Data)

Figure 10
ARSENIC CONCENTRATIONS IN GROUNDWATER
AND SURFACE WATER
(Concentrations In mg/L)
Waukegan Manufactured Gas And Coke Plant



SURFACE WATER

- SW-08 ① Surface Water Sample Location
August 1993

NO Shallow Sample
NO Deep Sample

Note:

In Water Less Than 10 Feet Deep,
Only The Shallow Sample Was Collected.

- L-1 ② Surface Water Sample Location
July 1996/August 1996/September 1997

GROUNDWATER

Soil Boring With Temporary Well
Point Sample (Deep Sample Collected)

- X SB-01 ① September 1993
- SB-04 ② September 1997

- ▲ MW-7 Monitoring Well Nest
Deep And Shallow Well Samples
April 1992/Sept.-Oct. 1993/
Nov.-Dec. 1993/July 1996/Sept. 1997
(Duplicate Results Are Averaged)
① April 1992, Sept.-Oct. 1993, And Nov.-Dec. 1993
② July 1996 And Sept. 1997

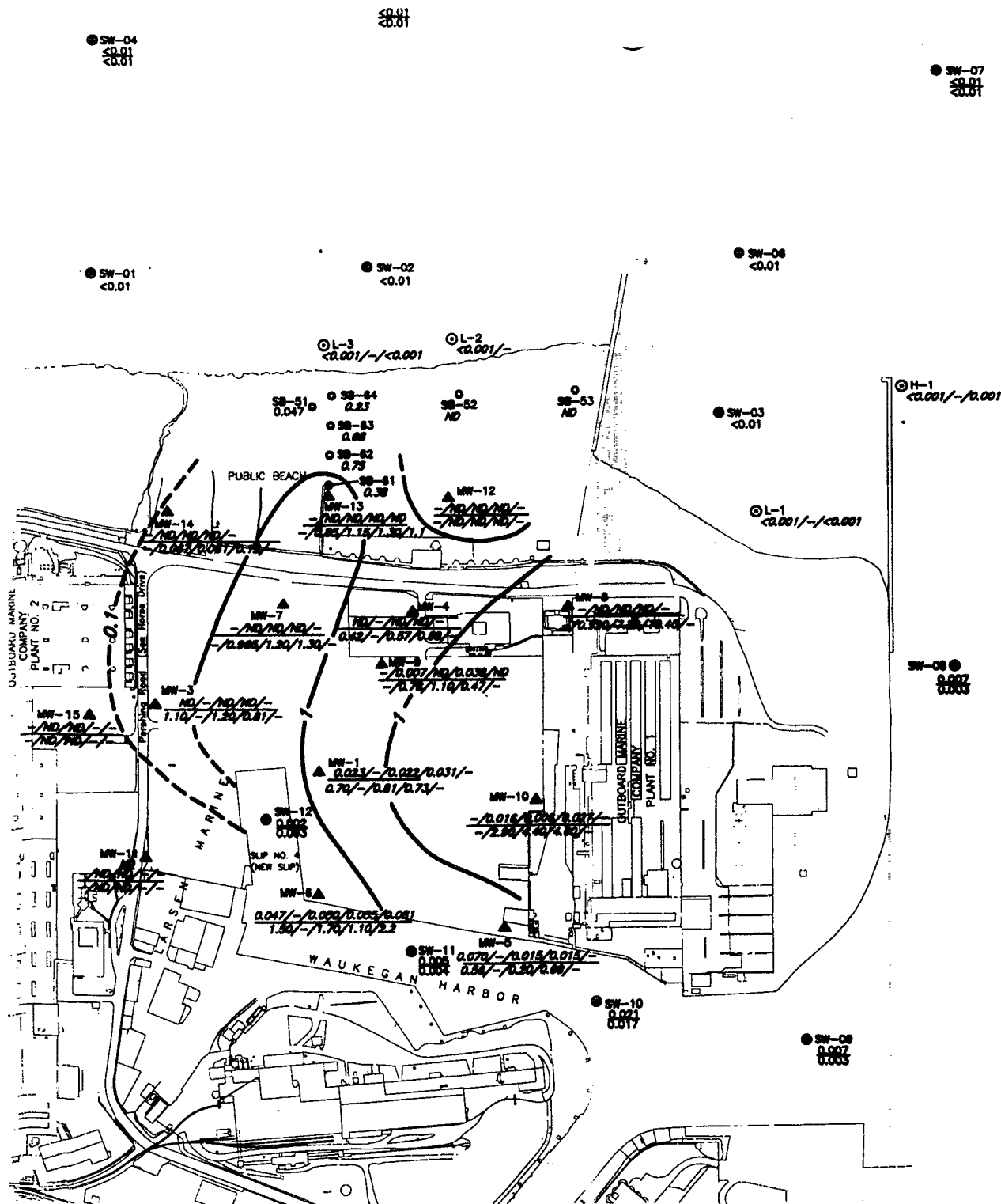
0.003/-0.003/0.004/- Sand Aquifer Shallow Well
1120/-/300/410 Sand Aquifer Deep Well

- NO Not Detected
- Not Sampled During Indicated Sampling Event
- Total Phenols Concentration Contour (mg/L)
1996 Samples (1997 if Available)
For Deep Monitoring Wells And
1997 Temporary Well
Point Samples
(Dashed Segments Indicate
Lack Of Bounding Data)

Note:

- ① Totals Determined By Summation Of
Phenolic Compounds By Method 8270.
- ② Totals Determined By 4AAP
Analytical Method.

Figure 11
TOTAL PHENOLS CONCENTRATIONS IN
GROUNDWATER AND SURFACE WATER
(Concentrations In mg/L)
Waukegan Manufactured Gas And Coke Plant



SURFACE WATER

- SW-08 Surface Water Sample August 1993
- L-1 Surface Water Sample July 1996/August 1996/September 1997
- L-1 H-1

GROUNDWATER

- Soil Boring With Temporary Well Point Sample (Deep Sample Collected) September 1993
- SW-04 September 1997
- ▲ MW-7 Monitoring Well Nest Deep And Shallow Well Samples April 1992/Sept.-Oct. 1993/Nov.-Dec. 1993/July 1996/Sept. 1997 (With Duplicate Results, Where Applicable)
- 0.07/-/0.015/0.015/- Sand Aquifer Shallow Well
- 0.01/-/0.01/-/0.01/- Sand Aquifer Deep Well
- ND Not Detected
- Not Sampled During Indicated Sampling Ev
- 1 Benzene Concentration Contour (mg/L) 1996 Samples (1997 If Available) For Deep Monitoring Wells And 1997 Temporary Well Point Samples (Dashed Segments Indicate Lack Of Bounding Data)

Figure 12
BENZENE CONCENTRATIONS IN GROUNDWATER AND SURFACE WATER
(Concentrations in mg/L)
Waukegan Manufactured Gas And Coke Plant

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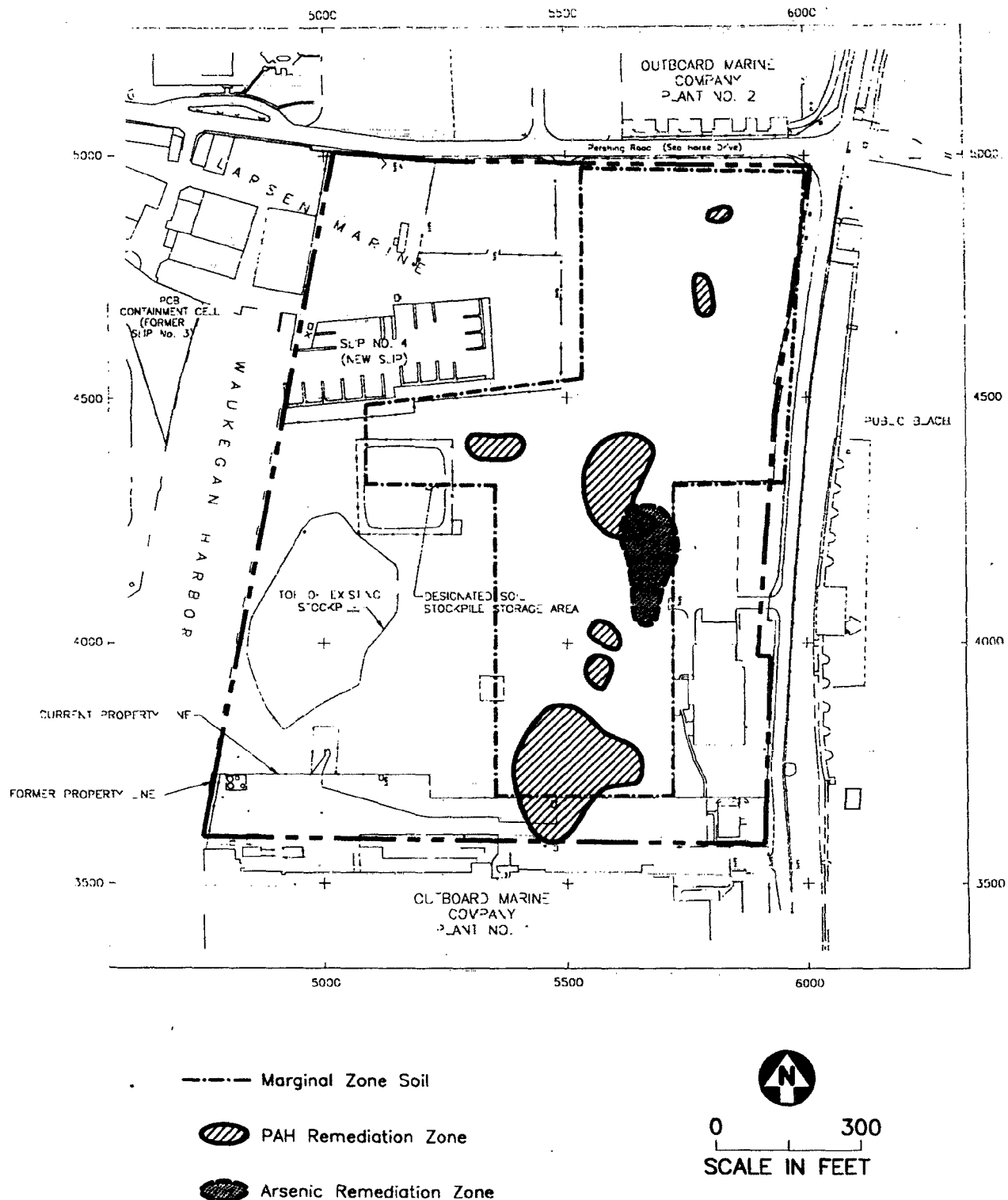
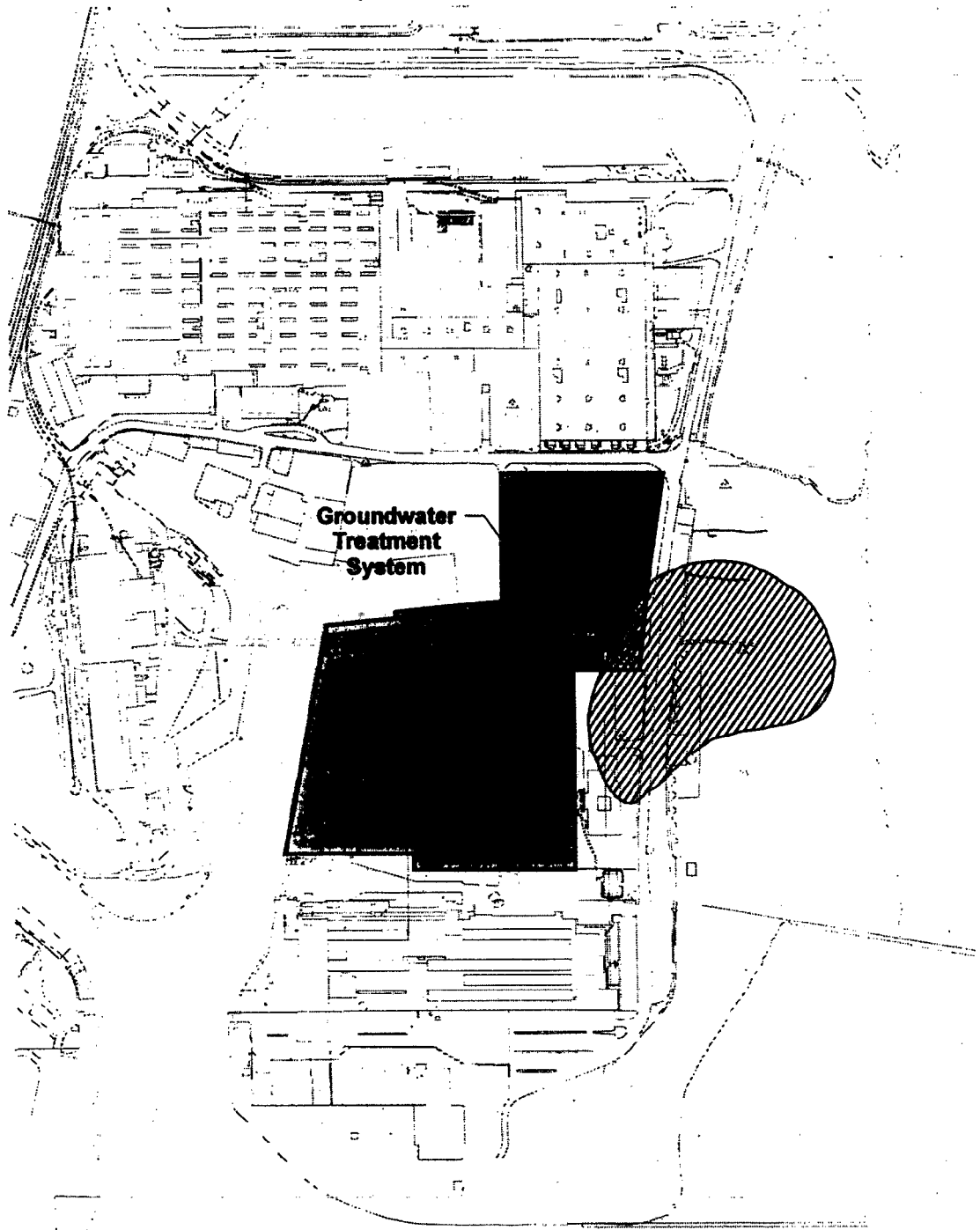


Figure 13
 ANTICIPATED AREA OF
 SOIL REMEDIATION
 Waukegan Manufactured Gas & Coke Plant Site



0 500 1000

Scale in Feet



Phytoremediation Cap



Groundwater Treatment Zone

Figure 14

Waukegan Manufactured Gas & Coke Plant Site

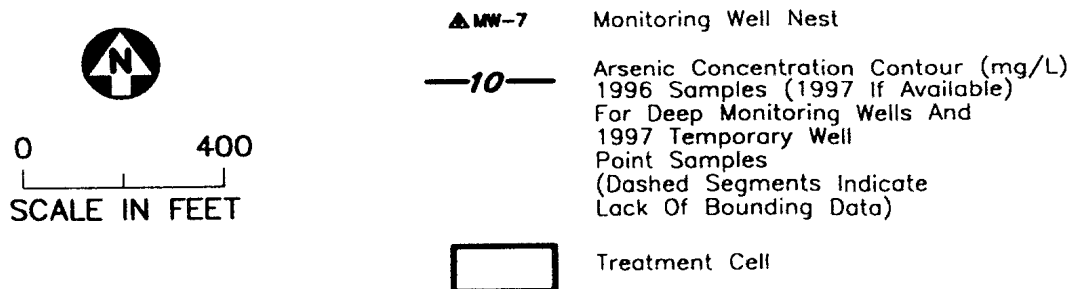
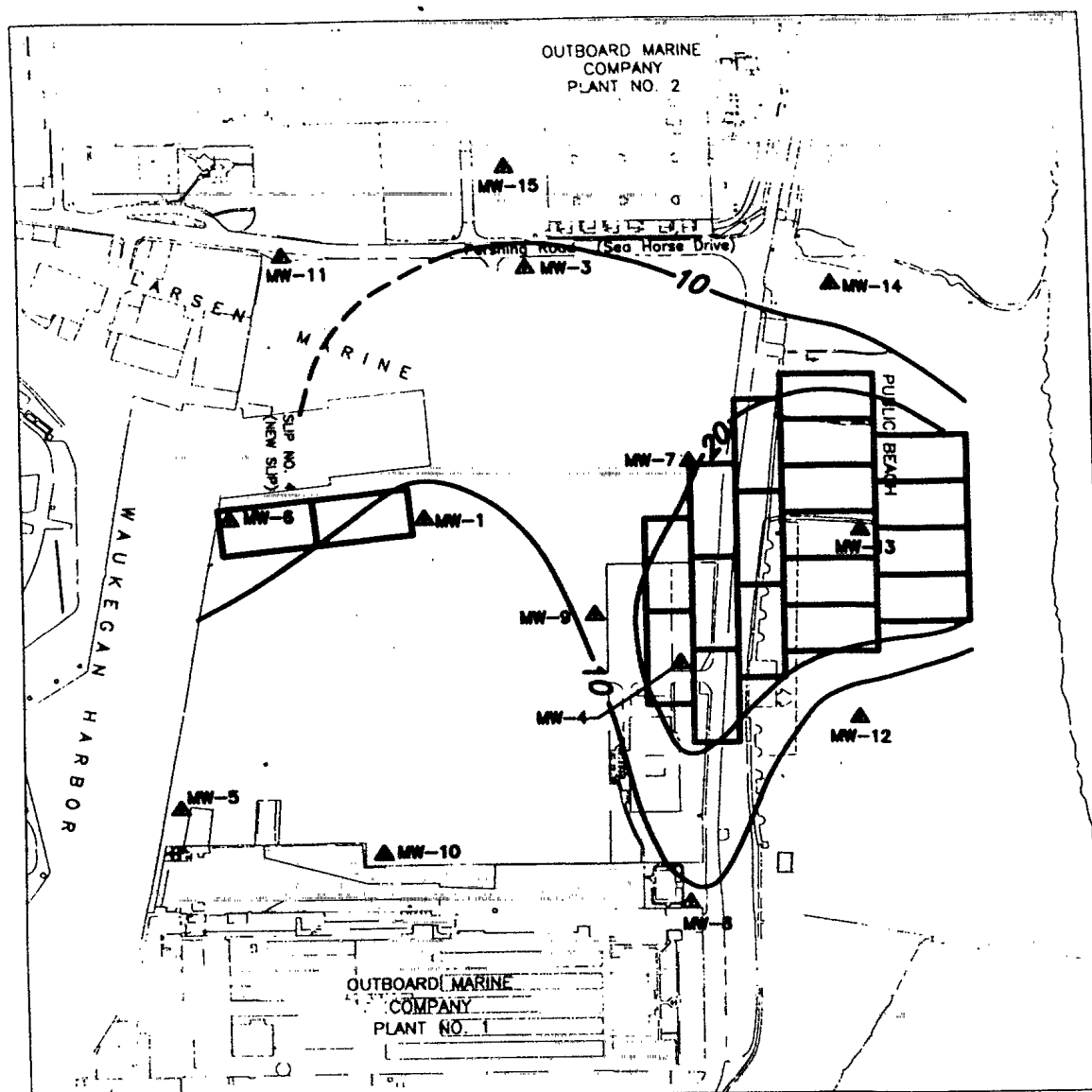


Figure 15.

TREATMENT CELL IMPLEMENTATION ZONE
 Waukegan Manufactured Gas & Coke Plant Site

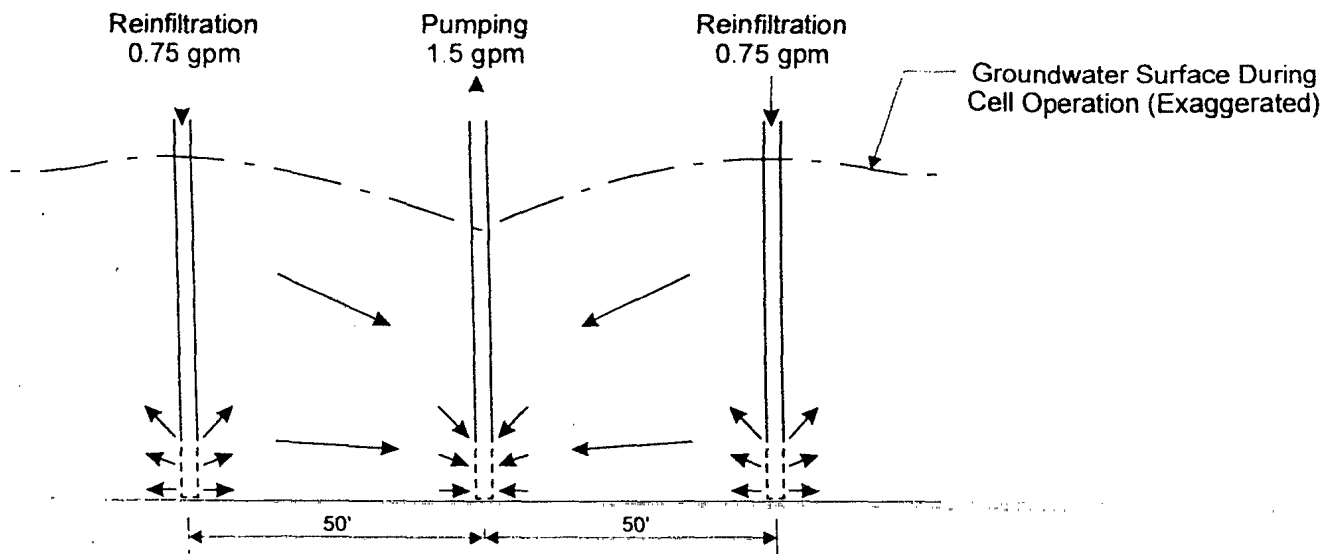
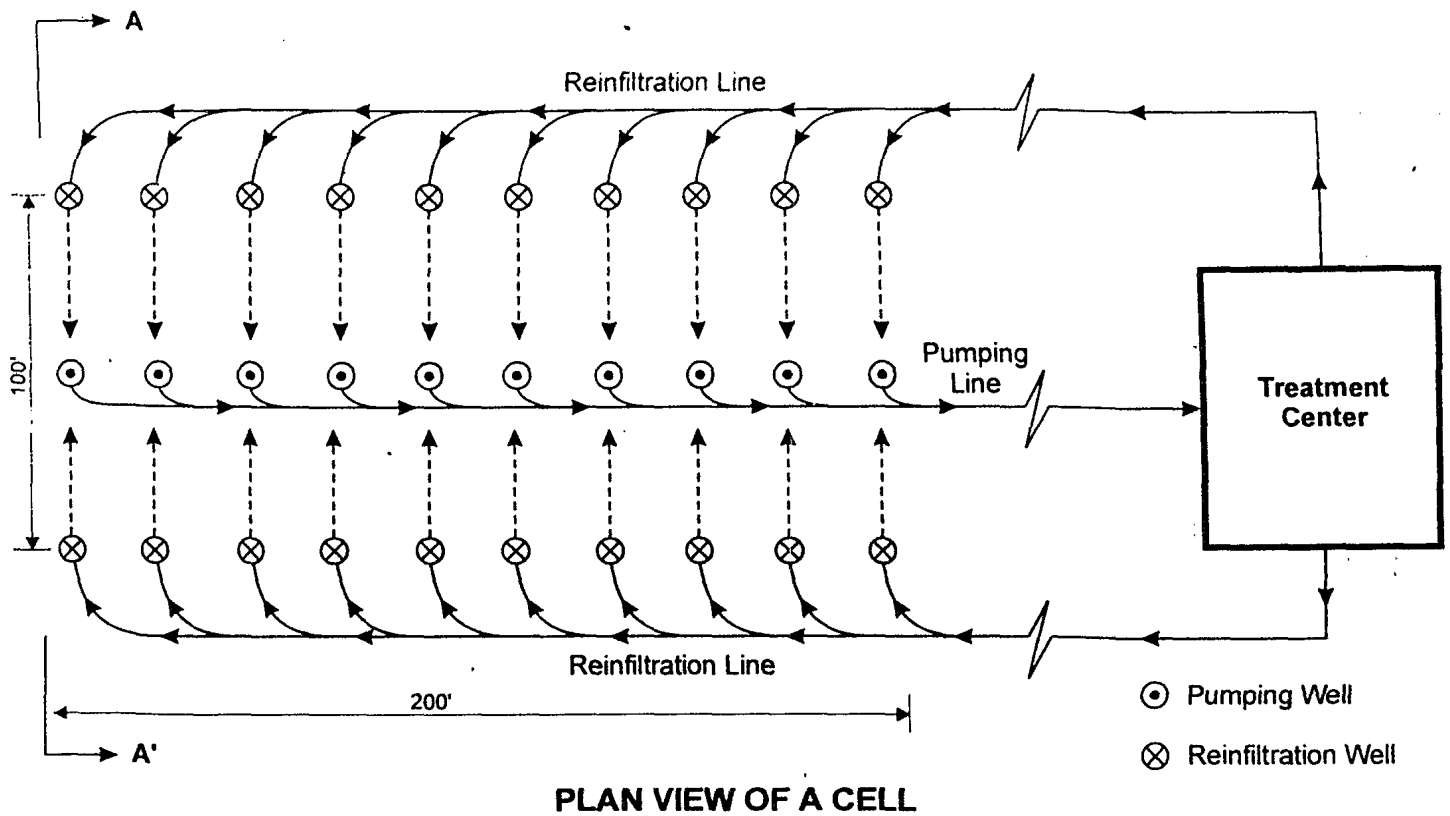


Figure 16.
CONCEPTUAL LAYOUT FOR A TYPICAL CELL
Waukegan Manufactured Gas & Coke Plant Site